101st Congress, 2d Session - - - - - - - - - - House Document 101-250

SLIDELL-PEARLINGTON, LOUISIANA AND MISSISSIPPI

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY DATED, APRIL 8, 1987, SUBMITTING A REPORT TOGETHER WITH ACCOMPANYING PAPERS AND ILLUSTRATIONS

OCTOBER 18, 1990.—Referred to the Committee on Public Works and Transportation and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
35-173 WASHINGTON : 1990

H 640-2

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LETTER OF TRANSMITTAL

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

REPLY TO
ATTENTION OF

4 OCT 1990

Honorable Thomas S. Foley
Speaker of the House
of Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

I am transmitting for information the views of the Secretary of the Army on the report dated April 8, 1987, from the Chief of Engineers, on Pearl River in Slidell-Pearlington, Louisiana and Mississippi, with other pertinent reports. These reports are in partial response to five resolutions of the Public Works Committee of the U.S. Senate dated April 1, 1963, June 27, 1967, March 12, 1974, and February 1 and May 9, 1979, and three resolutions of the Public Works and Transportation Committee of the U.S. House of Representatives all dated May 9, 1979. The Fiscal Year 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 401(b) of the Water Resources Development Act of 1986 (Public Law 99-662) authorized this project for construction, subject to a favorable report of the Chief of Engineers and approval by the Secretary of the Army.

The views of the States of Louisiana and Mississippi, the Departments of the Interior, and Housing and Urban Development, the Environmental Protection Agency, the Federal Emergency Management Agency and the Mississippi Department of Archives and History, are set forth in the enclosed communications.

I have affirmed the plan recommended in the report of the Chief of Engineers subject to the addition of the following local cooperation item:

> "Assume, in addition to other cost sharing responsibilities for the project, complete financial responsibility for the cleanup of any hazardous materials located on project lands and covered under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and be responsible for operating and maintaining, repairing, replacing, and rehabilitating the project in a manner so that liability will not arise under CERCLA."

The Administration supports implementation of this project through the budget process in accordance with the cost sharing provisions of Public Law 99-662. The Office of Management and Budget advises that there is no objection to the submission of this report to the Congress. A copy of its letter is enclosed in the report.

Sincerely,

Robert W. Page
Assistant Secretary of the Army
(Civil Works)

Enclosure

G. Edward Dickey
Acting Principal Deputy Assistant Secretary
(Civil Works)

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

August 6, 1990

Honorable Robert W. Page, Sr.
Assistant Secretary of
the Army (Civil Works)
Room 2E570 - Pentagon
Washington, D.C. 20310-0103

Dear Mr. Page:

As required by Executive Order 12322, we have completed our review of your recommendation, and the report on Slidell-Pearlington, Louisiana and Mississippi, enclosed with your letter of May 19, 1990.

The Office of Management and Budget does not object to your submitting this report to Congress for information and in partial response to the study authorities. We note that the recommended flood control improvements along Pearl River near Slidell, Louisiana, are already authorized for construction under the Fiscal Year 1985 Supplemental Appropriations Act (Public Law 99-88) and the Water Resources Development Act of 1986 (Public Law 99-662).

The above-mentioned recommendation is consistent with the program of the President, contingent upon project funding in accordance with cost-sharing provisions of P.L. 99-662.

Sincerely,

Robert E. Grady
Associate Director
for Natural Resources,
Energy and Science

COMMENTS OF THE STATE OF MISSISSIPPI

STATE OF MISSISSIPPI
GOVERNOR'S OFFICE OF FEDERAL-STATE PROGRAMS

BEVERLY W. HOGAN
Executive Director
Federal-State Programs

ROY DeBERRY
Director
Department of Planning and Policy

November 14, 1986

Arthur E. Williams
Colonel, Corps of Engineers
Executive Director
Engineer Staff
Department of the Army
Office of the Chief of Engineers
Washington, D.C. 20314-1000

Dear Colonel Williams:

This letter is being written in response to your letter to Governor Allain requesting comments on the proposed report of the Chief of Engineers on Slidell-Pearlington, Louisiana and Mississippi, and other pertinent reports and Final Environmental Impact Statement. The report was processed through Executive Order 12372, "Intergovernmental Review of Federal Programs", on September 9, 1986. No comments or concerns were received regarding this report. A copy of the clearinghouse form is attached.

Governor Allain's concerns for a comprehensive study have already been outlined in letters submitted to the District Engineer, Vicksburg District. These comments were compiled in cooperation with the State of Louisiana. Copies of the Louisiana and Mississippi letters are enclosed.

If I can provide any further information, please contact me.

Sincerely,

Roy DeBerry

RD:dh

Enclosure

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

BEVERLY W. HOGAN
Executive Director
Federal-State Programs

ROY DeBERRY
Director
Department of Planning and Policy

MEMORANDUM

TO: Department of the Army
Office of the Chief of Engineers
Washington, D.C. 20314-1000

DATE: November 12, 1986

FROM: STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

SUBJECT: REVIEW COMMENTS
Activity: The Final Environmental Impact Statement (FEIS) on the Slidell-Pearlington, Louisiana and Mississippi project.

State Application Identifier Number: MS860909-002

Location: Hancock/Southern

Contact: Arthur E. Williams

The State Clearinghouse, in cooperation with state agencies interested or possibly affected, has completed the review process for the activity described above.

INTERGOVERNMENTAL REVIEW PROCESS COMPLIANCE:

( ) We are enclosing the comments received from the state agencies for your consideration and appropriate action. The remaining agencies involved in the review did not have comments or recommendations to offer at this time. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) Conditional clearance pending Archives and History's approval.

(x) None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) The review of this activity is being extended for a period not to exceed 60 days from the receipt of notification to allow adequate time for review.

COASTAL PROGRAM COMPLIANCE (Coastal area activities only):

( ) The activity has been reviewed and complies with the Mississippi Coastal Program. A consistency certification is to be issued by the Bureau of Marine Resources in accordance with the Coastal Zone Management Act.

( ) The activity has been reviewed and does not comply with the Mississippi Coastal Program.

cc: Funding Agency (As requested by applicant)

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR
JACKSON 39205

BILL ALLAIN
GOVERNOR

POST OFFICE BOX 139

July 14, 1986

Colonel Pat Stevens, IV
District Engineer
U. S. Corps of Engineers
Vicksburg District
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel Stevens:

The Lower Pearl River System ranks high among the many interests shared by the States of Louisiana and Mississippi. The numerous and well-known economic, environmental and social values associated with the role of the Lower Pearl in our respective histories require little documentation here, and anyone who truly understands and appreciates these values will readily attest to the grave concerns to be expected whenever the river is significantly impacted by the acts of man or the events of nature.

Remarkable changes in the flow regime and flood plain of the Lower Pearl have resulted from both natural and man-caused events occurring over the last century. Information available to us now indicates that if positive action to stabilize the conditions causing these changes is not taken expeditiously, increased damage to the economies and environments of our respective states is inevitable.

A major aspect of our dilemma is insufficient information regarding the totality of actual, measurable changes that have occurred in the overall Lower Pearl River flow regime since the late 1800's. We must fully understand these changes, and their causes, before we can adequately identify the consequent impacts. Proposals to reduce or eliminate these impacts may then be developed accordingly. We well understand and agree that such proposals likely will entail redirection or diversion of some flow from the current configuration of the Lower Pearl's main channel. While flow adjustments of this nature are anticipated and acceptable as problem-solving measures, we also recognize that both the magnitude of such adjustments and the types, kinds and locations of associated structural measures will not be known until the comprehensive analysis just mentioned is completed.

Without question, the U. S. Army Corps of Engineers is the agency best suited to lead a comprehensive study of the Lower Pearl River Basin. With not only its historical experience in these matters but also its Congressionally authorized projects related to the Pearl River, the Corps should be able to draw together many sources of information to complement its own extensive capabilities. Therefore, as the Governor of Mississippi, I request the Corps to conduct a detailed, comprehensive study of the Lower Pearl River Basin to identify, quantify, analyze and recommend solutions for the wide range of problems now impacting the river's flow regime and related land resources. I believe that existing Congressional study authorizations, without more, are sufficient to permit the Corps to undertake such a study.

Of course, I pledge that all appropriate state agencies in Mississippi will work cooperatively and in good faith with the Corps and any other agencies involved to accomplish the goals of the study I am recommending in a timely, efficient and effective manner.

I urge your careful consideration of my proposal, and will be happy to have my representatives meet personally with you or anyone you designate to further discuss any aspect of the matter.

Respectfully,

Bill Alla

BILL ALLAIN
GOVERNOR

BA:djp

State of Louisiana
EXECUTIVE DEPARTMENT
Baton Rouge
70804-9004

EDWIN W. EDWARDS
GOVERNOR

POST OFFICE BOX 94004
(504) 342-7015

June 12, 1986

Colonel Pat Stevens, IV
District Engineer
U. S. Corps of Engineers
Vicksburg District
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel Stevens:

The Lower Pearl River System ranks high among the many interests shared by the States of Louisiana and Mississippi. The numerous and well-known economic, environmental, and social values associated with the role of the Lower Pearl in our respective histories require little documentation here, and anyone who truly understands and appreciates these values will readily attest to the grave concerns to be expected whenever the river is significantly impacted by the acts of man or the events of nature.

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Without question, the U. S. Army Corps of Engineers is the agency best suited to lead a comprehensive study of the Lower Pearl River Basin. With not only its historical experience in these matters but also its Congressionally authorized projects related to the Pearl River, the Corps should be able to draw together many sources of information to complement its own extensive capabilities. Therefore, as the Governors of Louisiana and Mississippi, we jointly request the Corps to conduct a detailed, comprehensive study of the Lower Pearl River Basin to identify, quantify, analyze, and recommend solutions for the wide range of problems now impacting the river's flow regime and related land resources. We believe that existing Congressional study authorizations, without more, are sufficient to permit the Corps to undertake such a study.

Of course, we pledge that all appropriate state agencies in Louisiana and Mississippi will work cooperatively and in good faith with the Corps and any other agencies involved to accomplish the goals of the study we are recommending in a timely, efficient, and effective manner.

We urge your careful consideration of our proposal, and will be happy to have our representatives meet personally with you or anyone you designate to further discuss any aspect of the matter.

Respectfully,

Edwin Edwards

EDWIN W. EDWARDS
Governor of Louisiana

BILL ALLAIN
Governor of Mississippi

COMMENTS OF THE STATE OF LOUISIANA

Department of Transportation and Development
P.O. BOX 94245 CAPITOL STATION
BATON ROUGE, LA 70804-9245

Robert G. Graves
SECRETARY

Edwin W. Edwards
GOVERNOR

December 2, 1986

504 - 379-1204

Lieutenant General E. R. Heiberg. III
Chief of Engineers
ATTN: DAEN - CWP
Department of the Army
Washington, D. C. 20314-1000

Dear General Heiberg:

This office has reviewed the Final Main Report and Environmental Impact Statement for the Slidell, Louisiana and Pearlington, Mississippi Flood Control Plan. As the State of Louisiana's designated representative, we have requested comments from the Office of State Parks, the Louisiana Geological Survey, the Department of Wildlife and Fisheries, and the Department of Environmental Quality. Copies of the responses we received are included as attachments. We will forward the additional responses if and when we receive them. The following comments are offered as the State's position.

We find the recommended plan to be acceptable to the State of Louisiana as it will provide the needed flood protection without serious impacts to the state's environment.

The Department of Wildlife and Fisheries is "...generally satisfied that the project as described in the recommended plan can be implemented without serious adverse impacts to the area's fish and wildlife habitats and resources."

We commend the Corps of Engineers for working with the state agencies during the planning process which resulted in an acceptable plan. Thank you for the opportunity to comment.

Sincerely,

Marty Chabert
Assistant Secretary

MJC:sjb

ATTACHMENT

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA 70895

J BURTON ANGELLE, SR
SECRETARY
(504) 925-3617

EDWIN W EDWARDS
GOVERNOR

November 14, 1986

Mr. Edward J. Breckwoldt
Deputy Chief Engineer
Department of Transportation and Development
P. O. Box 94245
Baton Rouge, Louisiana 70804-9245

Re: Final Main Report,
Environmental Impact Statement -
Flood Control Plan, Slidell,
Louisiana and Pearlington, Mississippi

Dear Mr. Breckwoldt:

As requested we have attached our written comments pertaining to the above referenced report.

Sincerely yours,

Joe L. Herring
Assistant Secretary

JLH:CJK:fsb

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA 70895

J. BURTON ANGELLE, SR
SECRETARY
(504) 925-3617

EDWIN W. EDWARDS
GOVERNOR

November 14, 1986

Colonel Pat M. Stevens, IV
District Engineer
U. S. Army Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39180

Dear Colonel Stevens:

This office has reviewed the Final Main Report and Environmental Impact Statement for the Slidell, Louisiana and Pearlington, Mississippi Flood Control Plan. Our project evaluations and recommendations, which were presented at a public hearing and submitted in written form during the interim review period, have been included or addressed in the report.

We are generally satisfied that the project as described in the recommended plan can be implemented without serious adverse impacts to the area's fish and wildlife habitats and resources.

We appreciate the opportunity to offer our comments during the plan's final review.

Sincerely yours,

J. Burton Angelle

J. Burton Angelle
Secretary

JBA:CJK:fsb

STATE OF LOUISIANA
OFFICE OF STATE PARKS

DEPARTMENT OF CULTURE, RECREATION AND TOURISM
P.O. DRAWER 1111 • BATON ROUGE, LOUISIANA 70821-1111 (504) 925-3830

EDWIN W. EDWARDS
Governor

NOELLE LeBLANC
Secretary

GERALD F. GUIDROZ, Ph.D
Assistant Secretary

November 20, 1986

RECEIVED NOV 21 1986

Mr. Coan Bueche, Chief
Federal Projects Section
Department of Transportation and Development
Office of Public Works
P. O. Box 94245
Baton Rouge, LA 70804-9245

Re: U. S. Army Corps of Engineers, Pearl River Basin, Slidell, LA and Pearlington, MS, Interim Report on Flood Control - June 1986

Dear Coan ~~Mr. Bueche~~:

There are several Land and Water Conservation Fund recreation areas in the vicinity of this project. We have examined all the proposed plans and we do not believe that any of our areas will be adversely effected.

Sincerely,

Elinor

Elinor M. Craven
Director of Outdoor Recreation

EMC:JCG:rm

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 86/1108

OCT 15 1986

Lieutenant General E. R. Heiberg, III
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Heiberg:

Thank you for the letter of August 11, 1986, requesting our views and comments on the proposed report of the Chief of Engineers and the final environmental statement for Flood Control, Pearl River Basin, Slidell-Pearlington, St. Tammany Parish, Louisiana; and Hancock County, Mississippi.

Extensive coordination between the Fish and Wildlife Service, the Corps of Engineers (Vicksburg District), and the Louisiana Department of Wildlife and Fisheries has resulted in the development of an environmentally acceptable plan for the project. Because significant wetlands exist in the area, and our preferred form of mitigation in those areas is avoidance, we would oppose any modifications to the selected levee alignment. We concur with the recommended plan as described in your report.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

COMMENTS OF THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

U.S. Department of Housing and Urban Development
Fort Worth Regional Office, Region VI
1600 Throckmorton
Fort Worth, Texas 76113-2905

AUG 28 1986

Lieutenant General E. R. Heiberg, III
Chief of Engineers
ATTENTION: DAEN-CWP
Department of the Army
Washington, D. C. 20314-1000

Dear General Heiberg:

The Main Report and the Final Environmental Impact Statement for the Pearl River Basin, Slidell, LA, and Pearlington, MS, have been reviewed by this office. The report is comprehensive and considers 10 alternative plans. The recommended plan, which is a combination of Plan D and Plan E, appears to be economically feasible.

The recommended plan, which provides for 200-year protection, approximates the 1983 Pearl River flood of record. Protection is provided to the Slidell area both north and south of Interstate Highway 10. The proposed action is environmentally acceptable to this office.

It is noted that the study area of Pearl River Basin includes a small area within the State of Mississippi which is outside of the jurisdiction of this office. The State of Mississippi is within the Department's Atlanta Regional Office. If you have not already done so, you may desire a review from that office. Mr. Raymond Harris is the Regional Administrator and his address is: Richard B. Russell Federal Building, 75 Spring Street, S. W., Atlanta, Georgia 30303-3388.

Sincerely,

Sam R. Moseley
Regional Administrator--
Regional Housing Commissioner

COMMENTS OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Emergency Management Agency
Washington, D.C. 20472

DEC 2 1986

Lieutenant General E. R. Heiberg III
Chief of Engineers
Department of the Army
Washington, DC 20314-1000

ATTENTION DAEN-CWP

Dear General Heiberg:

This is in reference to the letter of August 11, 1986, from Colonel Arthur E. Williams, Executive Director, Engineering Staff, which transmitted copies of the proposed report of the Chief of Engineers on Slidell-Pearlington, Louisiana and Mississippi, other pertinent reports, and a Final Environmental Impact Statement (FEIS). We have reviewed the transmitted material in light of the minimum requirements of the National Flood Insurance Program and offer our comments below.

North of Interstate Route 10

The major flooding source in this area is riverine from the Pearl River. We noted on the current effective Flood Insurance Rate Map (FIRM) for St. Tammany Parish dated March 1, 1984, that the recommended plan for this area locates the levee for the majority outside the 100-year floodplain. The resulting outboard 100-year sump storage areas are proposed to operate at lower elevations than the current effective Base Flood Elevations (BFEs) for those areas. The lower BFEs for after-project conditions will undoubtedly precipitate requests from the community for a FIRM revision to reflect the reduced flood hazard. No Federal Emergency Management Agency (FEMA) map revisions may be initiated until the project plan north of Interstate Route 10 has reached the level of completion defined at 44 CFR 61.12, as amended October 1, 1986.

South of Interstate Route 10

The recommended plan for this area also locates the levee outside the riverine 100-year floodplain, with approximately two-thirds of the southern system located in the area subject to coastal flooding. For the coastal flooding portion of the levee (as well as the riverine portions of the system), we wish to emphasize that the standards for levees at 44 CFR 65.10 must be met before FEMA can adjust flood hazard areas and BFEs on the basis of the project. Additionally, as with the northern system, no FEMA map revisions may be initiated until the provisions at 44 CFR 61.12 are met and documented.

Should you have any questions concerning these comments, please feel free to contact members of our Headquarters staff in Washington, D.C., at (202) 646-2754.

Sincerely,

Brian R. Mrazik /Elsai

Brian R. Mrazik, Ph.D.
Assistant Administrator
Office of Risk Assessment
Federal Insurance Administration

cc: Mr. Herman A. Sharp, President, St. Tammany Parish

COMMENTS OF THE MISSISSIPPI DEPARTMENT OF ARCHIVES AND HISTORY

Established 1902

Mississippi Department of Archives and History

Post Office Box 571 • Jackson, Mississippi 39205-0571 • Telephone 601-359-1424
Elbert R. Hilliard, Director

September 10, 1986

Office of the Chief of Engineers
Attn: DAEN-CWP
Corps of Engineers
Washinton, D.C. 20314-1000

RE: Final Environmental Impact Statement on the Slidell,
LA-Pearlington, MS Flood Control project

Dear Sirs:

We have reviewed the above FEIS and concur with the assessments for cultural resources as indicated on page 43 of the document. Thank you for allowing us to comment.

Sincerely,

ELBERT R. HILLIARD
State Historic Preservation Officer

Roger G. Walker

By: Roger G. Walker
Intergaency Coordinator
Division of Historic Preservation

RGW/rm

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

SEP 19 1986

Lieutenant General E. R. Heiberg III
Chief of Engineer
ATTN: DAEN-CWP
Department of the Army
Washington, D.C. 20314-1000

Dear General Heiberg:

We have completed our review of your Final Feasibility Report and Environmental Impact Statement (EIS) for the Slidell, Louisiana and Pearlington, Mississippi Flood Control Study.

Based upon our review and evaluation of the proposed action as described, we believe the selected alternative is acceptable from the standpoint of environmental quality, human health and welfare within EPA's areas of jurisdiction and expertise.

Thank you for your cooperation.

Sincerely yours,

Clinton B. Spotts

Clinton B. Spotts
Chief, Federal Activities Branch (6E-F)

cc: New Orleans District Engineer

SLIDELL-PEARLINGTON, LOUISIANA AND MISSISSIPPI

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

DAEN-CWP-S

April 8, 1987

SUBJECT: Slidell-Pearlington, Louisiana and Mississippi

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on Slidell-Pearlington, Louisiana and Mississippi. It is accompanied by the reports of the Board of Engineers for Rivers and Harbors and the District and Division Engineers. These reports are in partial response to five resolutions of the Public Works Committee of the United States Senate dated 1 April 1963, 27 June 1967, 12 March 1974, and 1 February and 9 May 1979, and three resolutions of the Public Works and Transportation Committee of the United States House of Representatives all dated 9 May 1979. The Board was requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, with respect to flood control, damage prevention, and related purposes.

2. The District and Division Engineers considered both structural and nonstructural measures to reduce flood damages. The reporting officers' recommended plan would provide 200-year frequency flood and hurricane protection for Slidell, Louisiana, by means of two levees separated by Interstate Highway 10. The approximately 4.5 mile-long north levee feature would include a pumping station and eight other interior drainage structures. The approximately 10.5 mile-long south levee element would include two pump stations and six other interior drainage structures. The recommended plan maximizes net national economic development benefits. No plans were found to be implementable for Pearlington, Mississippi.

3. The Board concurs in the findings of the reporting officers and recommends flood control improvements in accordance with the reporting officers' selected plan. The Board believes that the proposed report is in compliance with Executive Order No. 11988 and that it would not induce additional floodplain growth. After consideration of geographic and other data, the Board found that, with or without the proposed project, full residential development of the study area floodplain would take place.

4. I concur in the findings, conclusions, and recommendations of the Board and note that the project has been authorized by P.L. 99-88 and P.L. 99-662. Based on October 1986 price levels, the overall first cost of the recommended plan is estimated at $20,708,000 of which $5,308,000 would be non-Federal based on the cost sharing policies set forth in P.L. 99-662. Average annual charges, based on an interest rate of 8-7/8 percent and a 100-year period for economic analysis, are $2,265,000 including $154,000 for non-Federal operation and maintenance. Average annual benefits are estimated at $3,410,000 and the benefit-to-cost ratio is 1.5.

5. The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect programmed budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Accordingly, I acknowledge that the recommendations may be modified before they are transmitted to Congress as proposals for implementation funding.

MG, USA

for F. R. HEIBERG III
Lieutenant General, USA
Chief of Engineers

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060-5576

REPLY TO
ATTENTION OF:
BERH-PLN

29 June 1986

SUBJECT: Slidell - Pearlington, Louisiana and Mississippi

Chief of Engineers
Department of the Army
Washington, DC 20314-1000

SUMMARY OF BOARD ACTION

The Board concurs in the recommendations of the Division Engineer and the District Engineer for flood control improvements along the West Pearl River in Slidell, Louisiana. The recommended plan consists of a 4.5-mile-long levee system providing 200-year-frequency protection against riverine flooding for residential subdivisions north of Interstate Highway 10 (I-10), and a 10.5-mile long levee system providing the same level of protection against both river and hurricane flood events for many of the subdivisions south of I-10. The total first cost of these two levee systems is estimated at $20,672,000, of which $4,270,000 would be non-Federal under traditional cost-sharing policies. The benefit-cost ratio is 1.6. The Board recommends the proposed plan subject to cost-sharing and financing arrangements satisfactory to the President and the Congress.

SUMMARY OF REPORT UNDER REVIEW

1. AUTHORITY. The Slidell, Louisiana, and Pearlington, Mississippi, interim report was conducted as part of the ongoing Pearl River Basin study which was authorized by eight congressional resolutions quoted in the District Engineer's report, including two resolutions for which studies were already funded. In addition, the Energy and Water Development Appropriation Bills of 1983 and 1984 specifically addressed the Slidell - Pearlington area. The study authorities requested the Board of Engineers for Rivers and Harbors to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, with respect to flood control, damage prevention, and related purposes. A final report will be submitted later.

2. DESCRIPTION OF STUDY AREA. The study area consists of approximately 65,000 acres in the southern part of the Pearl River Basin, Louisiana and Mississippi. It is dissected by both the east and west branches of the Pearl Rivers. The study area includes the urban center of Slidell in St. Tammany Parish,

Louisiana, and the town of Pearlington in Hancock County, Mississippi. It also includes a portion of the Pearl River Wildlife Management Area.

3. The study area is part of a region known as the Coastal Flatlands. Drainage is generally poor with large areas subject to annual flooding. Residential subdivisions are frequently located between bayous and swamps. Structures are primarily in higher elevation pine hardwood areas. Elevations vary from near sea level at the southern end of the basin to near 35 feet national geodetic vertical datum at the town of Pearl River, Louisiana. There are significant natural resources, including the Pearl River estuarine system, which provide ideal habitat for a wide variety or finfish and shellfish of sport, commercial, and scientific value.

4. ECONOMIC DEVELOPMENT. The population of St. Tammany Parish, a suburb of New Orleans, increased 74 percent between 1970 and 1980, and the population of Hancock County increased 41 percent during the same period. Slidell's population increased from 16,101 to 26,718, an increase of 66 percent, from 1970 to 1980. The majority of this change is associated with growth in the overall New Orleans metropolitan area. More than 50 percent of its residents commute to New Orleans daily. Much of the growth in the Slidell floodplain has been in the form of residential subdivisions with homes valued from $100,000 to $500,000. Due to convenient transportation access to New Orleans, a quality infrastructure, and highly desirable aesthetics, the Slidell floodplain along the West Pearl River is expected to continue to develop more rapidly than alternative housing areas in St. Tammany Parish. The Pearlington study area is predominantly rural. Its largest commercial areas consist of public and private marinas and docking facilities along with scattered retail establishments. Growth potential in the Pearlington area is relatively low.

5. EXISTING FEDERAL IMPROVEMENTS

a. A navigation channel from the mouth of the West Pearl River to the vicinity of Bogalusa, Louisiana, a distance of about 58 miles was completed by the U.S. Army Corps of Engineers (USACE) in 1956. The channel was authorized at a 7-foot depth and bottom widths of 100 feet in the river sections and 80 feet in the lateral canal section. Three navigation locks and two sills control water levels in the canal. Commercial navigation on West Pearl River has declined to the extent that maintenance of channel dimensions to accommodate such traffic is no longer justified and the waterway is now limited to recreational craft.

b. The East Pearl River navigation project, completed in 1911, provides a navigation channel 9 feet deep, 200 feet wide, and about 1.3 miles long connecting the 9-foot contour in Lake Borgne with the same contour in the East Pearl River.

c. The National Aeronautics and Space Administration (NASA) has a 20-mile-long and 12-foot-deep navigation channel on the East Pearl River extending from Lake Borgne to its test facility in Hancock County. The USACE maintains the project for NASA on a cost reimbursable basis.

6. PROBLEMS AND NEEDS

a. FLOODING FROM PEARL RIVER. The study area is primarily affected by flooding resulting from heavy rainfall over the Pearl River Basin and the Bogue Chitto River Basin, the closest major tributary to the study area. In recent years, major flooding has occurred in 1979, 1980, and 1983. The 1983 flood was estimated to be a 200-year-frequency event and the Pearl River crested at 21.2 feet in the lower basin. Flood damage in the Slidell area was estimated at $5.5 million. Flooding at Slidell is generally limited to the area east of Military Road and U.S. Highway 190, and damages occur to homes, a few commercial establishments, roads, bridges, and utilities. Some areas west of Military Road are also susceptible to backwater flooding from the Pearl River.

b. FLOODING FROM HURRICANES. Parts of the study area are also subject to hurricane surges along with tide and wave action. Hurricane Camille in 1969 caused some damages in the Pearlington area, primarily due to 6- to 9-foot tides. Flooding from hurricane surges is generally limited to the area south of Doubloon Bayou. Pearlington is within the hurricane surge area, but has some limited protection by U.S. Highway 90 acting as a barrier. Hurricanes have caused no problems in the Slidell area in the recent past.

7. IMPROVEMENTS DESIRED. Local interests desire a comprehensive flood damage prevention plan which would provide a high level of flood protection, reduce the threat to public health and safety, and minimize the decline of fish and wildlife habitat in the area.

8. ALTERNATIVES CONSIDERED. Various nonstructural and structural alternatives were considered by the District Engineer. Only four economically feasible levee plans were carried into the final analysis. Prior to detailed assessment and evaluation of these plans, studies were conducted to determine necessary pump sizes for removal of interior drainage and the least costly source of borrow material for the levee embankment.

9. PLAN OF IMPROVEMENT. The District Engineer's recommended plan would provide 200-year-frequency flood and hurricane protection for Slidell by means of two levees separated by the I-10 highway. The plan for the area north of I-10 consists of an approximately 4.5-mile-long levee, along with a pumping station and eight other interior drainage structures. The area south of I-10 would be protected by an approximately 10.5-mile-long levee, two pump stations, and six other interior drainage structures. The recommended plan maximizes net national economic development (NED) benefits. No plans were found to be implementable for Pearlington.

10. ECONOMIC EVALUATION. Based on October 1985 price levels, the District Engineer estimates the first cost of his proposed plan to be $20,672,000. Under traditional cost-sharing policies, $4,270,000 would be non-Federal. Average annual charges, based on an 8 5/8-percent interest rate and a 100-year period for economic analysis, are $2,196,000 including $153,600 for operation and maintenance. Average annual benefits are estimated at $3,480,000 and the benefit-cost ratio is 1.6.

11. RECOMMENDATION OF THE REPORTING OFFICERS. The District Engineer recommends improvements for flood control along the West Pearl River at Slidell, Louisiana, authorized in conformance with Public Law 99-88, be implemented as a Federal project. His recommendation is made subject to cost-sharing and financing arrangements satisfactory to the President and the Congress. The District Engineer also recommends that no further flood control studies be undertaken for Pearlington, Mississippi. The Division Engineer concurs.

REVIEW BY THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

12. GENERAL. The Board's review encompassed the overall technical, economic, social, institutional, environmental, and policy aspects involved in the formulation of alternative plans, and in the findings, conclusions, and recommendations of the reporting officers. The Board considered conformance of the recommended plan with essential elements of the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The Board also considered the views of local interests as well as Federal, State, and local agencies. Particular attention was given to the nature and extent of flood damage reduction benefits associated with future development.

13. RESPONSES TO THE DIVISION ENGINEER'S PUBLIC NOTICE. The Division Engineer issued a public notice on 30 September 1985 stating the recommendations of the reporting officers and inviting interested parties to provide comments to the Board.

Six letters were received in response to the public notice. Two letters expressed support for the proposed plan. One letter expressed concern over adverse impacts of the Slidell levees on flood stages across the Pearl River at Pearlington, Mississippi. One letter opposed inclusion of wetlands within the south levee portion of the plan and indicated that sump area lands should be purchased rather than controlled by easement and zoning. Two letters requested additional information on levee alignment in relation to specific properties. The content and nature of these letters were carefully considered in the Board's review. No significantly measureable increase in water surface profiles is expected with construction of the proposed levees, and the requirements of local cooperation are considered sufficient to protect and control sump area lands.

14. FINDINGS AND CONCLUSIONS. The Board of Engineers for Rivers and Harbors concurs in the findings and recommendations of the reporting officers. The proposed improvements are engineeringly feasible, economically justified, and environmentally acceptable. The recommended plan is the NED plan. It was selected based on public interests, its minimal environmental impact, and its positive contribution to economic stability and well-being of the affected area. Nonstructural plans developed by the reporting officers at the Board's request were found to be economically inferior to the recommended levee plan. Also, the Board concludes that although some small amount of land enhancement may take place with implementation of the recommended plan, such enhancement does not meet established criteria for requiring special cost sharing.

15. In conjunction with the Board's review, the reporting officers obtained additional and current information on housing values, the rate of housing development in the study area from 1978 through 1985, the average size of residential lots recently developed and planned for development, and the costs and benefits of residential floodproofing. The conclusions derived from this information and an updated economic evaluation were included in revisions to the District Engineer's report. The updated analysis indicates that the project benefit-cost ratio, based on existing development only, is 0.7. Considering development expected to be in place by year 1992 at the conclusion of project construction, the benefit-cost ratio would be 1.4. Economic justification of the proposed plan is therefore dependent on expected continued development in the floodplain in the absence of the project.

16. The Board carefully considered alternative areas to development of the floodplain in the vicinity of Slidell and the fact that all new residential development in the floodplain must conform to regulations requiring first floor elevations to be

above the 100-year-frequency flood. The Board believes that the proposed project is in compliance with Executive Order No. 11988 and that the project would not induce additional floodplain growth. Based on available geographic information and data presented by the reporting officers, the Board finds that the various amenities of the eastern Slidell area, including its convenience to New Orleans, would continue to attract floodplain development regardless of the availability of other developable flood-free residential areas. With or without the proposed project, trends indicate that full residential development of the project area would take place by year 2003. In addition, the Board considered a sensitivity analysis based on alternative floodplain growth rates. It found that the average growth rate of 240 structures per year assumed in the District Engineer's report could be reduced to about 55 structures per year and the overall project benefit-cost ratio would still be above unity. However, with this lower growth rate, full development of the project area would not take place until about year 2050. After considering all facts, the Board concludes that the reporting officers' proposed plan is economically viable and that Federal participation in the plan is in the public interest.

17. The Administration's policy on water project financing and cost sharing is that all Federal water development agencies will continue to seek out new partnership arrangements with the States and other non-Federal interests in the financing and cost sharing of the proposed projects. Each such agency will negotiate reasonable financing arrangements for every project within its respective area of responsibility. In addition, prior commitments to individual States with regard to water development within their borders will be considered and shall be a factor in negotiations leading up to project construction. Consistency in cost sharing for individual project purposes, with attendant equity, will be sought. Project beneficiaries, not necessarily governmental entities, should ultimately bear a substantial part of the cost of all project development.

18. RECOMMENDATIONS. The Board recommends that flood control improvements for Slidell, Louisiana, be implemented generally in accordance with the reporting officers' recommended plan, with such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost-sharing and financing arrangements satisfactory to the President and the Congress. This recommendation is made with the provision that, prior to implementation, non-Federal interests will, in addition to the general requirements of law for this type of project, agree to comply with the following requirements:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for the project, including borrow, ponding, and disposal areas necessary for implementation and later maintenance of the project;

b. Hold and save the United States free from damages due to implementation and later maintenance of the project, not including damages due to the fault or negligence of the United States or its contractors;

c. Maintain and operate all works after completion, including a flood warning system and any major replacement of pumps and related facilities, in accordance with regulations prescribed by the Secretary of the Army;

d. Accomplish without cost to the United States all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements necessary for the project excluding railroad bridges and approaches and facilities necessary for the normal interception and disposal of local interior drainage at the line of protection;

e. Prescribe and enforce regulations or other management techniques to prevent encroachment on floodplain areas, channels, rights-of-way, and levees, along with interior drainage, ponding and sump areas, necessary for proper functioning of the project; and, if interior drainage, ponding, or sump areas are impaired, provide promptly and without cost to the United States substitute storage or equivalent pumping capacity; and

f. Publicize floodplain information in areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

19. The Board also recommends that no further studies for flood damage reduction measures for the community of Pearlington, Mississippi, be undertaken at this time.

20. The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Accordingly, the Board acknowledges that the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

FOR THE BOARD:

N. G. DELBRIDGE, JR.
Major General, USA
Chairman

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

This investigation of the water resources needs of the area is being conducted in response to eight Congressional resolutions.

Major flooding from the Pearl River was experienced in the Slidell area in 1979, 1980, and 1983. During these floods, minor flooding was also experienced in the Pearlington area. The Flood of Record in the Lower Pearl River Basin occurred in 1983 and caused an estimated $5.5 million in damages in the Slidell area. Approximately 700 to 800 homes and some commercial businesses were flooded, roads and bridges were inundated, and utilities were damaged. The I-10 embankment was inundated 4 days and the US 90 embankment was inundated 1 day. In addition to flooding from the Pearl River, the study area south of I-10 is also subject to hurricane flooding.

Many alternative flood control measures were evaluated to develop a comprehensive plan for flood protection for the area. Levees were determined to be the only feasible alternatives.

The Louisiana Department of Transportation and Development (LDOT), in conjunction with the U. S. Geological Survey (USGS) and the Federal Highway Administration, is evaluating possible mitigation measures needed to prevent the overtopping of the I-10 and US 90-190 embankments. These measures slightly impact the flood damage analysis and design height of the levees. Based on target backwater reductions furnished by LDOT and USGS, three levee alignments were feasible for the Slidell area--one north of I-10 and two south of I-10. No plans were feasible for the Pearlington area.

The recommended plan, which is the NED plan, is a combination of levee alignments both north and south of I-10 that provides 200-year flood protection to the area. Based on an interest rate of 8-5/8 percent, a 100-year project life, and October 1985 price levels, the total average annual benefits derived from protecting this area would be approximately $3,480,000. The estimated cost is $20.7 million with a benefit-cost ratio of 1.6.

DEPARTMENT OF THE ARMY
VICKSBURG DISTRICT, CORPS OF ENGINEERS
P O BOX 60
VICKSBURG MISSISSIPPI 39180-0060

REPLY TO
ATTENTION OF:
LMKPD-Y

9 June 1986

SUBJECT: Pearl River Basin Interim Report on Flood Control and Environmental Impact Statement, Slidell, Louisiana, and Pearlington, Mississippi

Commander, Lower Mississippi Valley Division

INTRODUCTION

1. The study limits, shown on Plate J-1, comprise the two urban areas of Slidell, Louisiana, and Pearlington, Mississippi, and a large portion of the Pearl River Wildlife Management Area (WMA), a total of approximately 65,000 acres. The study area is dissected by both the East and West Pearl Rivers. The flood plain in the study area is approximately 4.5 miles in width. It is naturally low and flat and is influenced by the tide on the extreme southern end.

2. The Pearl River originates in Neshoba County, Mississippi, and flows some 415 miles in a southerly direction to Lake Borgne. The Basin drains a large portion of Mississippi and a part of southeastern Louisiana. The drainage area of the Pearl River Basin at the mouth is about 8,760 square miles.

3. Tributary streams within the Slidell, Louisiana, area which were included in the interior drainage portion of the study include Doubloon Bayou, French Branch, Gum Bayou, and Gum Creek. The total interior drainage area is about 34 square miles with ground elevations ranging from near sea level to about 35 feet, National Geodetic Vertical Datum (NGVD).

4. The Pearlington, Mississippi, area has several bayous that remove the interior drainage. Two of these bayous--Whites and Cowan--are influenced greatly by tidal forces.

5. Major floods in the Slidell area, along the West Pearl River, were experienced in 1979, 1980, and 1983. Pearlington was generally not affected by any headwater flooding except in 1983. Pearlington is often affected more by hurricanes than by headwater flooding, and local residents generally agree that the worst flooding was caused by Hurricane Camille in 1969.

6. Most major floods on the Pearl River are caused by intense and heavy rainfall over the Pearl and Bogue Chitto River Basins. These floods generally cause more damages along the West Pearl River because the flow characteristics of the Basin direct more of the flow in this direction.

7. The primary objective of this study is to develop a comprehensive plan, which if implemented, would alleviate or reduce flooding in the study area.

8. The most significant flood losses in the Slidell area are inflicted upon roads and residential structures. During the Flood of Record in 1983, major flooding was experienced generally east of Military Road and US 190. In all, approximately 700 to 800 structures were flooded and many more would have been except for individual floodfighting efforts.

9. Flooding in the area is aggravated by the network of highways that criss-cross the area. The 1980 flood forced the closing of I-10 for several hours as the crest passed. During the 1983 flood, I-10 was closed again for 4 days and US 90 was closed for 1 day. As a result of the overtopping of I-10 in 1980, the Louisiana Department of Transportation and Development (LDOT), working with the Federal Highway Administration (FHWA), initiated a study of the I-10 embankment with the U. S. Geological Survey (USGS). The purpose of this study was to determine what mitigation measures are needed to alleviate the repeated overtopping of the I-10 embankment. Recent results of this study indicate that a new 1,000-foot bridge span appears to be the best solution for this problem. Additional studies were undertaken following the 1983 flood of the area in and around US 90-190 to determine if possible modification by LDOT could alleviate this overtopping and backwater effect. The data results of these studies are summarized in a letter from LDOT dated 21 June 1985 (see Attachment 1).

STUDY AUTHORITY

10. The Slidell, Louisiana, and Pearlington, Mississippi, flood control study is being conducted as a part of the ongoing Pearl River Basin study. This study was authorized by eight Congressional resolutions, including two for which studies were already funded. The resolutions, which are quoted in Appendix A, are listed below. In addition, the Energy and Water Development Appropriation Bills of 1983 and 1984 specifically addressed the Slidell-Pearlington area and are included in Appendix A.

Date	Resolution	Committee
1 Apr 63	Town Creek at Jackson, Mississippi	Senate Public Works
27 Jun 67	Town Creek at Jackson, Mississippi, downstream to Byram	Senate Public Works
12 Mar 74	Pearl River Basin, Mississippi and Louisiana	Senate Public Works
1 Feb 79	Richland Creek, Richland, Mississippi	Senate Environment and Public Works

Date	Resolution	Committee
9 May 79	Pearl River Basin, Mississippi and Louisiana	Senate Environment and Public Works
9 May 79	Richland, Mississippi	House Public Works and Transportation
9 May 79	Pearl River Basin, Mississippi and Louisiana	House Public Works and Transportation
9 May 79	Pearl River, Mississippi	House Public Works and Transportation

PROJECT AUTHORITY

11. The FY 85 Supplemental Appropriations Act (Public Law 99-88), dated 15 Aug 85, authorized and directed the Secretary of the Army, acting through the Chief of Engineers, to proceed with planning, design, engineering, and construction of structural and nonstructural measures as deemed feasible to reduce flood damages in St. Tammany Parish, Louisiana, pending binding cost-sharing arrangements acceptable to the Secretary of the Army, or under terms and conditions provided for in subsequent legislation when enacted into law. The authorizing legislation as contained in this Act is quoted in Appendix A.

SCOPE OF STUDY

12. The flooding in the Slidell area was addressed by the Mobile District, Corps of Engineers, in the Pearl River Basin Reconnaissance Report, October 1981. This report considered channel modifications, removal of bridge restrictions, and construction of levees to resolve flood problems in the Slidell area. Subsequent flooding and development of additional data indicated that levee plans along with nonstructural measures should be further evaluated for the Slidell area.

13. Following the April 1983 flood the Slidell and Pearlington areas were placed on an expedited study schedule.

14. This report presents the results of studies to determine the magnitude of the flooding in the area and possible alternative solutions to these problems. All alternatives were screened and analyzed in sufficient detail to determine which plan(s) best satisfies the objectives of flood control, environmental preservation, and public desires.

15. The plan selection process includes development of the plan(s) which produces the maximum net economic benefits consistent with protecting the nation's environment.

EXISTING PROJECTS AND PRIOR STUDIES AND REPORTS

EXISTING PROJECTS

16. Existing projects constructed by the Corps of Engineers in the vicinity of the study area are described below.

17. Construction was completed in 1956 on the West Pearl River navigation project. This project, authorized by the River and Harbor Act of 1935, provides a navigation channel from the mouth of the West Pearl River to the vicinity of Bogalusa, Louisiana, a distance of about 58 miles. The project is shown on Plate J-2. The 7-foot-deep channel has a bottom width of 100 feet in the river sections and 80 feet in the lateral canal section. Three locks with inside dimensions of 65 by 310 feet and two sills control water levels in the canal. Commercial navigation on the West Pearl River declined to the extent that maintenance of the channel dimensions was not economically justified. The last dredging to accommodate commercial traffic was in 1973, and use of the waterway is now limited to recreational craft.

18. The East Pearl River navigation project, completed in 1911, was authorized by the River and Harbor Act of 1910. It provides a navigation channel 9 feet deep, 200 feet wide, and about 1.3 miles long at the mouth of the river, connecting the 9-foot contour in Lake Borgne with the same contour in the East Pearl River. The project, shown on Plate J-3, experiences some commercial traffic and is maintained on an irregular basis, which averages about once in 5 years. The National Aeronautics and Space Administration (NASA) has an existing 20-mile-long and 12-foot-deep navigational channel on the East Pearl River that extends from Lake Borgne to the NASA Mississippi Test Facility in Hancock County. The Corps performs dredging on this project for NASA on a cost-reimbursable basis.

CURRENT STUDIES UNDERWAY

19. Currently, there are three navigation studies underway. At the request of local interests in both Slidell and Bogalusa, Louisiana, a reevaluation of the existing West Pearl River navigation project has been undertaken. In 1972 the State of Louisiana designated the West Pearl River as a "Natural and Scenic River" and there is environmental opposition to dredging the West Pearl River for navigation purposes. This study will determine the economic and environmental feasibility of maintaining the project to authorized dimensions for commercial navigation. If resumed maintenance of the project is determined to be feasible, additional studies will be conducted to determine the feasibility of enlarging the existing facilities to accommodate large commercial vessels.

20. Studies are also underway to determine the feasibility of extending navigation on the East Pearl River up to Picayune, Mississippi. The navigation studies on the East and West Pearl Rivers are being conducted concurrently and should be completed in mid-1987.

21. Another study is being conducted in the area to evaluate the feasibility of providing a 12-foot navigational channel to Port Bienville Industrial Park, Mississippi. The Port Bienville Industrial Park is located on Mulatto Bayou, adjacent to the East Pearl River near its mouth and very near the Louisiana-Mississippi state line, about 30 miles east-northeast of New Orleans. The Mobile District completed a draft report in September 1984, recommending a navigation channel 12 feet deep and 115 feet wide be authorized as a Federal project for construction from the Gulf Intracoastal Waterway through the Rigolets and Little Lake, Louisiana, and East Pearl River, Mississippi, to the public terminals within the Port Bienville Industrial Park.

EXISTING CONDITIONS

STUDY AREA

22. The study limits for the Slidell and Pearlington flood control study are shown on Plate J-1. It is located in the southern part of the Basin, extending from approximately US 90 upstream to about 3 miles above I-59. Detailed studies were limited to the West Pearl River and portions of the East Pearl River in the vicinity of the Pearlington community.

23. The area is characterized by subdivisions located between bayous and bald cypress and tupelo swamps. Structures are primarily nestled in pine-hardwood areas.

24. Area roads have a great impact on the study area. I-10 from Bay St. Louis separates the Slidell portion of the study area into two parts. I-10 and I-59 and vicinity bound the study area on the west with US 90 as the southern boundary. US 90 also splits the Pearlington area into two parts. Local residents in Slidell attribute part of the flooding in the area to the backwater caused by I-10 and US 90.

25. The Slidell portion of the study area lies outside the city limits and is governed by the St. Tammany Parish Police Jury. The Pearlington community is unincorporated.

TOPOGRAPHY

26. The topography of the Slidell and Pearlington areas is characterized by relatively flat, poorly drained lands. The Pearl River flood plain separates the two urban areas and is characterized by marsh areas and bald cypress and tupelo gum areas separated by intermingled water bodies and tributaries of the Pearl River. The West Pearl River flows pass Slidell while the East Pearl River flows by Pearlington. Subdivisions in the urban portions of the study area are separated by several bayous, low depressions, and wetlands. Floodflows within the study area are relatively slow because of the flat terrain, dense vegetative growth, and an accumulation of sand and debris in the rivers and their tributaries. The only noticeable change in elevation occurs along the banks of the bayous and the Pearl River. Elevation changes are generally more pronounced in the Pearl River, Louisiana, community than in other locations. Elevations in the study area vary from near sea level at the southern end to near 35 feet, NGVD, at Pearl River, Louisiana.

CLIMATE

27. The climate is typical of that experienced along the northern Gulf of Mexico--long, warm, humid summers and short, mild winters. Because of the moderating effect of the Gulf, temperatures are usually mild and subtropical in nature, but are subject to occasional wide variations. Based on 84 years of recorded data at nearby Bay St. Louis, Mississippi, the normal annual temperature is 67 degrees F. The average temperature for the summer months (June-August) is 82 degrees F and in the winter (December-February) 53 degrees F. The highest temperature recorded was 104 degrees F and the lowest was 2 degrees F.

28. Rainfall averages 63 inches annually, but actual yearly values vary widely. Based on an 84-year period of record at Bay St. Louis, the highest recorded rainfall was 101.47 inches in 1900. Other wet years were 1929 with 89.46 inches and 1961 with 83.81 inches. The driest year on record is 1962 with 28.66 inches followed by 1968 with 37.58 inches and 1954 with 37.94 inches. Normal monthly values show July as the wettest month with 6.76 inches while October is the driest with only 2.36 inches. Winter and spring storms account for 50 percent of the yearly rainfall; summer thunderstorms account for 30 percent with the remaining 20 percent occurring in the fall. National Weather Service data indicate that the study area will experience tropical storms and hurricanes at a frequency of three tropical storms and two hurricanes per century. High winds and heavy rainfall can be expected during these events.

SIGNIFICANT RESOURCES

29. There are a number of significant manmade and natural resources in the study area, including homes, businesses, utilities, sanitation facilities, roads, bridges, parks, and boat docks.

30. Natural resources considered particularly significant in the study area are the Pearl River WMA, West Pearl River, East Pearl River, numerous fishery resources, wetlands, bayous, tupelo and bald cypress swamps, timber and wood products, sand and gravel, petroleum and natural gas, Fritchie Marsh, and the nesting area of the bald eagle in the White Kitchen's area.

31. The Pearl River estuarine system encompasses a part of the study area. The Pearl River flood plain from the mouths of the rivers to US 90 is nearly all coastal marsh, consisting of approximately 23,000 acres. The fish and wildlife resources of the Pearl River estuary are of great importance. These resources are a product of the long expanse of coastal marsh and shallow estuarine water bodies which provide ideal habitat for a wide variety of fin fish and shellfish of sport, commercial, and scientific value.

LAND USE

32. Existing land use in the study area was analyzed by the Vicksburg District. This survey, essentially an inventory of land use, consisted of identification of land uses by field observation and the plotting of each use on aerial photographs. The acres occupied by each land use were obtained from these photographs. The study area was broken down into the two urban areas.

33. A summary of land use for the Slidell project area is presented in Table 1. Each category is depicted in acres and percentages. These existing land uses are presented on Plate J-4.

TABLE 1
SUMMARY OF EXISTING LAND USE
BY ACREAGE AND RELATED PERCENTAGES
SLIDELL PROJECT AREA
1984

Classification	Acreage	Percent of Total Acreage
Residential	5,375	24.9
Public and Semipublic	138	0.6
Parks and Playgrounds	34	0.2
Commercial	234	1.1
Industrial	0	0.0
Pasture and Agricultural	70	0.3
Wetlands	3,178	14.8
Marsh	4,508	20.9
Streets, Highways, and Vacant Land	8,021	37.2
Total	21,558	100.0

34. A summary of land use for the Pearlington project area is presented in Table 2. These existing land uses are depicted on Plate J-5.

TABLE 2
SUMMARY OF EXISTING LAND USE BY ACREAGE AND
RELATED PERCENTAGES
PEARLINGTON PROJECT AREA
1984

Classification	Acreage	Percentage
Residential	853	15.1
Public and Semipublic	23	0.4
Commercial	22	0.4
Industrial	31	0.6
Wetlands	1,764	31.3
Streets, Highways, and Vacant Land	2,939	52.2
Total	5,632	100.0

35. Another portion of the study area is in Pearl River, St. Joe, Alton, and Haaswood, Louisiana. A summary of this land use is presented in Table 3.

TABLE 3
SUMMARY OF EXISTING LAND USE
BY ACREAGE AND RELATED PERCENTAGES
PEARL RIVER, ST. JOE, ALTON, AND HAASWOOD, LOUISIANA
1984

Classification	Acreage	Percent of Total Acreage
Urban	2,215	36.1
Public Facilities	41	0.7
Water	154	2.5
Wetlands	758	12.3
Streets, Highways, and Vacant Land	2,975	48.4
Total	6,143	100.0

36. The remaining portion of the study area is primarily in the Pearl River WMA. This area is comprised of approximately 15 percent water bodies, 34 percent forested land, and 51 percent wetlands.

GEOGRAPHIC SETTING

37. The study area is contained within St. Tammany Parish, Louisiana, and Hancock County, Mississippi. It is divided by the West, Middle, and East Pearl Rivers approximately 8 miles upstream from the Rigolets and Little Lake. The study area is dissected by several interstate and U. S. highways (I-10, I-59, US 90 and US 190) and is located some 30 miles north of New Orleans and 200 miles south of Jackson, Mississippi.

ENVIRONMENTAL SETTING

38. The physical geography of the Lower Pearl River Basin is typical of many rivers in the southeastern United States. The low stream gradient and broad, flat flood plain produce extensive meanders, natural cutoffs, oxbow lakes, old river runs, bayous, and extensive forested flood plains. The study area is part of an area known as the Coastal Flatwoods. The terrain is basically flat with elevations ranging from 0 to 35 feet, NGVD.

39. Drainage is generally'poor with large areas subjected to some degree of annual flooding. The intensity of flooding varies from year to year or from one flooding period to another during the same year. Areas south of I-10 are

subject to some tidal action and hurricane storm surges. The area's humid subtropical climate produces mild winters and temperate summers with a mean annual temperature of approximately 67 degrees F. Average annual precipitation is 63 inches with July being the wettest month with 6.76 inches of rain. Soils in the northern part of the study area are predominately inceptisols. Between I-10 and US 90, the soils change to histosols or peat and muck. The inceptisols are generally of the poorly drainaged Bibb and Mantachie Series from the Haplaquepts Groups. Several areas along the West Pearl have more sandy soils. Because of scouring during flood periods, peat apparently does not accumulate in the northern portion.

SOCIOECONOMIC SETTING

40. Historical population trends for St. Tammany Parish and Hancock County (shown in Table 4) indicate the study area has experienced a steady growth in population over the last several decades. Data from the 1980 Census show a population of 135,406 for the St. Tammany Parish-Hancock County area, an increase of 156 percent since 1950. St. Tammany Parish, a suburb of New Orleans, has exhibited a stronger rate of growth than has predominantly rural Hancock County. The population of St. Tammany Parish increased by 47,284 persons (74 percent) from 1970 to 1980, whereas the population of Hancock County increased by 7,150 persons or 41 percent. In actuality, the population of St. Tammany Parish increased 430 percent over the past 50 years with more than half of this increase occurring in the last decade.

41. Slidell, the only large urban center in the study area, experienced an 851 percent increase in population over the 50-year period. A large portion of this increase was due to the outmigration from rural to urban areas, a pattern which occurred throughout the United States during the 1950's and 1960's. Historical trends reveal that Slidell has increased its share of the parish population from 12.2 percent in 1940 to 16.5 percent in 1960 to 24.1 percent in 1980. In the last decade, Slidell's population increased from 16,101 to 26,718, an increase of 66 percent from 1970 to 1980. The majority of this growth can be attributed to the growth of the New Orleans Metropolitan area, in which Slidell was included in the 1980 Census. Consequently, Slidell and the immediate area are experiencing growth at a rate substantially higher than the national average. Urban growth patterns for the Slidell area over the last 25 years are depicted on Plate J-6.

42. Population density for the study area averaged about 98.9 persons per square mile in 1980. Density of Hancock County and St. Tammany Parish was estimated to be 50.9 and 125.0 persons per square mile, respectively. Density for St. Tammany Parish alone increased over 311 percent from the 1950 density of 30.4 persons per square mile. The 1980 density of St. Tammany Parish is well above the 1980 State of Louisiana density of 93.6 persons per square mile.

43. From the discussion of demographics, it is apparent that the Slidell-Pearlington area is undergoing changes. In many ways, the changes parallel the nation as a whole. These include changes from rural to urban and suburban life, along with the shift of population concentration to the urban centers.

TABLE 4
HISTORICAL POPULATION STATISTICS FOR THE STUDY AREA BY COUNTY, PARISH, AND CITY OF SLIDELL
1950-1980
BY DECADE

Year	Study Area		Hancock County		St. Tammany Parish		Slidell	
	Population	Percent Increase	Population	Percent Increase	Population	Percent Increase	Population	As Percent of Parish
1950	38,879		11,891		26,988		3,464	12.9
1960	52,982	36	14,339	21	38,643	43	6,356	16.5
1970	80,972	53	17,387	21	63,585	65	16,101	25.4
1980	135,406	67	24,537	41	110,869	74	26,718	24.1

SOURCE: County and City Data Book; Bureau of the Census, U. S. Census of Population, U. S. Department of Commerce; *Economic Base Study--Slidell, Louisiana-Pearlington, Mississippi*, Vicksburg District, Corps of Engineers.

Like the nation, there has been an aging of the population, but unlike the nation, there has been a decline in the nonwhite proportion of the population. There has also been a significant growth in the housing stock. Changes in economic characteristics, including employment, income, and levels of business activity, have paralleled the demographic changes.

FUTURE WITHOUT-PROJECT CONDITIONS

44. The future without-project conditions are the future conditions that can be expected to prevail without adopting new programs for flood damage prevention. Slidell is located approximately 30 miles north of downtown New Orleans and is commonly referred to as a "bedroom community of New Orleans" because more than 50 percent of its residents commute daily to New Orleans. After completion of the I-10 highway system linking Slidell to New Orleans in the late 1960's, urban development increased in the project area more than 200 percent. Much of this growth has been in the West Pearl River flood plain in the form of exclusive residential subdivisions with homes valued from $100,000 to $500,000. Due to the easy access to transportation to New Orleans, the existing infrastructure in the area, better school system, high quality shopping and related commercial development, and the highly desirable esthetics, the West Pearl River flood plain is expected to continue to develop much more rapidly than other areas of the parish. Since the April 1983 flood, there has been approximately 600 new residential structures constructed in the flood plain. These trends are expected to continue until the project area is fully developed with or without the flood control plans. However, it is recognized that with the implementation of flood control improvements, the potential exists for the rate of development to increase somewhat.

LAND USE

45. The planning of urban flood control measures requires an assessment of future land use conditions within the study area. The knowledge of existing and future urban developments is required to make accurate estimates of rainfall runoff, peak flows, flow velocity, and highway improvements, and all vital considerations in the design of an urban flood control project.

46. Future residential land needs were based on the anticipated number of residential dwellings required for projected population increases. The project area east of Slidell is experiencing the greatest population growth rate of any area in St. Tammany Parish. Consequently, residential development in this area is constrained only by natural barriers and state and Federal regulations.

47. Approximately 25 percent of the available land in the Slidell portion of the project area is in residential use. Based on population projections and an increasing population density ranging from 5.56 to 5.92 persons per acre, residential land use is projected to increase by 59 percent by the year 2000. The population of the Slidell project area was determined to be 28 percent of the total population of St. Tammany Parish.

48. Presently, commercial land use in the Slidell project area accounts for slightly more than 1 percent of the total land available. Based on St. Tammany Parish Department of Development recommendations, commercial land

is expected to increase to nearly 2.6 percent of total land available by the year 2000. Thereafter, the effects of residential developmental constraints are expected to reduce the demand for future expansion of the commercialized area.

49. Some industrial development is anticipated to occur in the Slidell area. Public lands are expected to remain the same, with agriculture and vacant lands being converted to residential and commercial uses. Wetlands will remain constant due to the many state and Federal regulations. Future land use for the Slidell area is shown on Plate J-7.

50. The Pearlington project area is basically rural in nature. No development codes or standards exist. Based on population projections and an increasing population density ranging from 0.633 person per acre in 1980 to 0.743 person per acre in 2040, residential land use is expected to increase by 41 percent by the year 2040.

51. The largest commercial areas in the Pearlington project area consist of public and private marinas and docking facilities. The remainder is made up of scattered retail establishments. Due to the rural nature of the area and the proximity of large shopping centers in the Slidell and Bay St. Louis areas, commercial land usage is expected to remain constant over the next 50 years.

52. Public and semipublic lands are expected to increase slightly in the next 50 years. Industrial growth in Pearlington is expected to take place at Port Bienville, which is outside the project area. Vacant lands are expected to be converted to primarily residential use, and wetlands are expected to be unaltered through the year 2040. Future land use for the Pearlington area is shown on Plate J-8.

53. Detailed projections of future land use in the Pearl River, St. Joe, Alton, and Haaswood, Louisiana, area were not investigated.

54. Land within the Pearl River WMA will remain constant because of state ownership.

ENVIRONMENTAL SETTING

55. In the absence of a physical barrier such as a levee, encroachment upon the Pearl River flood plain will continue. Conversion of agricultural lands, wooded lands, and grasslands to cleared urbanized areas will eliminate consumptive wildlife uses and recreational opportunities in those areas. Areas currently below the 100-year flood elevation will be filled to the 100-year flood elevation in order to be developed in compliance with the regulations of St. Tammany Parish and the National Flood Insurance Program. Urbanization and other manmade changes alter successional patterns and the corresponding wildlife densities. Continued urbanization and loss of hunting along the periphery of the Pearl River WMA could aggravate competition for hunting in the WMA.

SOCIOECONOMIC SETTING

56. Projections for this analysis were developed by the Vicksburg District, Corps of Engineers. These projections, based on OBERS forecasts, are used to represent the expected future growth trends of Hancock County and St. Tammany Parish. Projections are based on extensions of past trends, adjusted where necessary to reflect the changing national/regional economy, and inter- and intraagency population migrations. Projection methodologies are designed to provide reliability for the short term; for periods beyond the year 2000, growth trends are extrapolations conditioned by national trends.

57. Population projections for the study area for the years 1980 to 2040 are presented in Table 5. Population in St. Tammany Parish is expected to increase from 110,869 in 1980 to 325,338 by 2040, for an average annual growth rate of 3.2 percent. The population of Hancock County is projected to reach 69,010 by the year 2040, exhibiting an average annual growth rate of 3.1 percent.

TABLE 5
PROJECTED POPULATION AND DENSITY
HANCOCK COUNTY AND ST. TAMMANY PARISH
1980-2040
BY DECADE

Year	Hancock County		St. Tammany Parish	
	Population	Density	Population	Density
1980	24,537	50.9	110,869	125.0
1990	32,877	68.2	143,750	162.1
2000	42,068	87.3	180,761	203.8
2010	53,153	110.3	214,827	242.2
2020	57,986	120.3	246,701	278.1
2030	63,258	131.2	283,304	319.4
2040	69,010	143.2	325,338	366.8

SOURCE: Vicksburg District, Corps of Engineers.

58. Based on the population projections presented in Table 5, population density will continue to increase throughout the study period, and by 2040 will have increased to 366.8 persons per square mile in St. Tammany Parish, an increase of 194 percent. Population density in Hancock County is also expecting a substantial increase of 143.2 persons per square mile by 2040 or 181 percent.

59. Employment projections for Hancock County and St. Tammany Parish from 1980 to 2040 are presented in Table 6. However, the true pattern of growth will be determined by the ability of the area to attract industry and the continuation of Slidell's function as a bedroom community to the greater New Orleans metropolitan area.

TABLE 6
PROJECTED EMPLOYMENT BY RESIDENCE FOR THE STUDY AREA
HANCOCK COUNTY AND ST. TAMMANY PARISH
1980-2040
BY DECADES

Year	Employment by Residence		
	Study Area	Hancock County	St. Tammany Parish
1980	42,450	6,450	36,000
1990	55,356	8,632	46,724
2000	69,799	11,045	58,754
2010	83,783	13,956	69,827
2020	95,412	15,225	80,187
2030	108,693	16,609	92,084
2040	123,865	18,119	105,746

SOURCE: Vicksburg District, Corps of Engineers.

PROBLEMS AND NEEDS

FLOODING FROM THE PEARL RIVER

60. The study area is primarily affected by headwater flooding caused by the Pearl River. Headwater flooding is caused by unusually heavy and intense rainfall over the Pearl and Bogue Chitto River Basins.

61. The flooding in the Slidell area during the larger floods was generally limited to the area east of Military Road and US 190. Damages in this area occur to homes, a few commercial establishments, roads and bridges, and utilities. Some areas west of Military Road along the bayou and branches are susceptible to the backwater effects of the Pearl River.

62. For future without-project conditions, flood damages in the Slidell area resulting from flood events less than the 100-year frequency flood should remain near present levels since the National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency (FEMA), requires that all new development in St. Tammany Parish be elevated above the base 100-year flood plain elevation. Approximately 30 percent of the existing structures are below the 100-year flood event. These structures would still be affected by floods less than the 100-year event depending on the location and elevation. Storms in excess of the 100-year event will result in an increase in damages because of continued development in the area.

63. Flooding in the Pearlington area during the higher flood events is generally limited to a few homes, stores, and roads. Pearlington, according to residents, becomes an island during major storms as all roads leading out of the main part of town become inundated. Past flooding caused by the Pearl River generally has not inflicted major damages to the area. Pearlington is more susceptible to damages from hurricanes than headwater flooding of the East Pearl River. The Pearlington area will continue to experience approximately the same amount of flood damage under future without-project conditions because the rate of development will remain relatively unchanged.

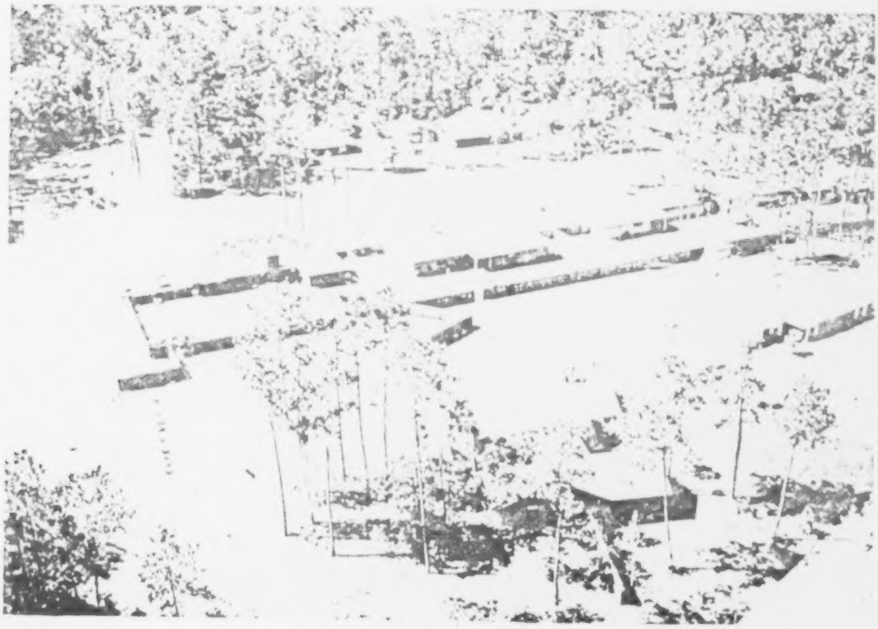
Recent Major Floods

64. 21-24 April 1979. This flood was estimated to be a 30-year event. Large amounts of rainfall occurred in the upper part of the Pearl River Basin with 19.6 inches being recorded at Louisville, Mississippi. Much lesser amounts of rainfall were recorded in the lower part of the Basin. Average rainfall over the Basin was about 5 inches for the 2- to 3-day period. The peak stage at Pearl River, Louisiana, was 19.3 feet on 26 April.

65. 2 April 1980. This flood was estimated to be a 60-year event. Rainfall amounts were fairly uniformly distributed over the Pearl River Basin during this 5-day event ranging from 8.6 inches at Franklinton, Louisiana, to 15.1 inches at McComb, Mississippi. The magnitude of the peak stage (19.8 feet at Pearl River, Louisiana) in the Pearl River-Slidell area was augmented by the fact that the Pearl and Bogue Chitto Rivers peaked almost simultaneously at their confluence.

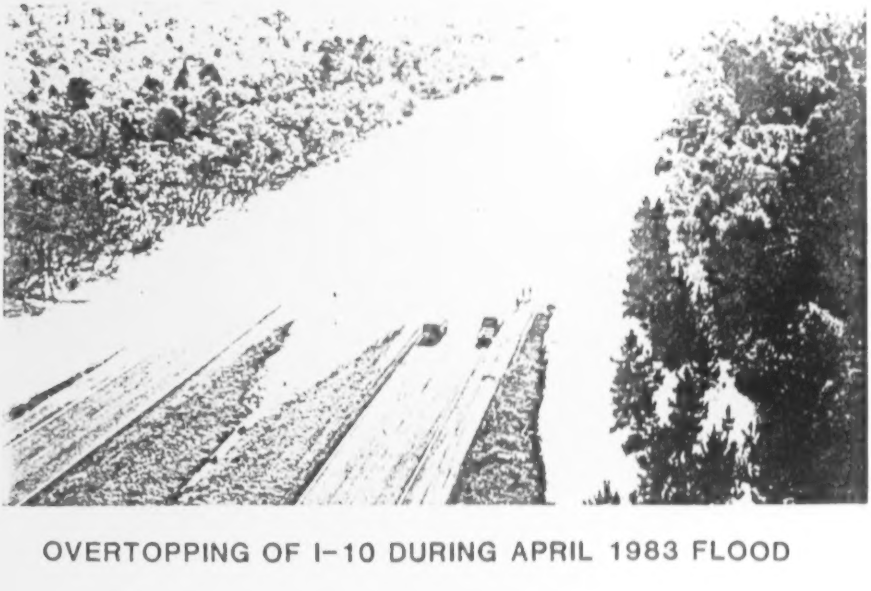
66. 2-8 April 1983. The lower Pearl River Basin was hardest hit by the April 1983 flood. This flood, as depicted on Plate J-9, was estimated to be a 200-year event. Rainfall for the month of April was above normal over the entire Basin, ranging from 169 percent above normal at Edinburg, Mississippi, to 380 percent above normal at Columbia, Mississippi. A total of 18.3 inches of rainfall was recorded at Columbia, Mississippi, during the period 2-8 April. Peak stage at the Pearl River, Louisiana, gage was 21.2 feet on 9 April 1983. Damage estimates in the Slidell area exceeded $5 million. Photographs on pages 16-18 depict typical flood scenes that occurred in the Slidell area during the April 1983 flood. Key subdivisions and trailer parks in the Slidell area are identified on Plate J-10. Many of these subdivisions were flooded by the April 1983 event. Magnolia Forest had about 45 homes flooded. The River Gardens/Riverview area was especially hard-hit with 335 homes flooded. The Cross Gates Subdivision had over 50 homes flooded; almost all of the homes in Frenchmen's Estates were flooded when water overtopped Military Road. The Tammany Trailer Park had 100 mobile homes flooded, and the River Oaks Subdivision had 50 homes flooded. The number of homes flooded would have been much higher if it were not for the sandbagging and other floodfighting activities. During the flood, the Vicksburg District provided over 319,000 sandbags to the St. Tammany Parish Police Jury to help in these floodfighting activities. In Pearlington, Mississippi, only 8 structures above US 90 and 6 structures below US 90 were flooded causing relatively minor damages.

FLOODING IN SLIDELL, LOUISIANA SOUTH OF I-10



FLOODING IN SLIDELL, LOUISIANA SOUTH OF I-10

FLOODING IN SLIDELL, LOUISIANA NORTH OF I-10



OVERTOPPING OF I-10 DURING APRIL 1983 FLOOD

FLOODING IN SLIDELL, LOUISIANA SOUTH OF I-10

FLOODING IN SLIDELL, LOUISIANA SOUTH OF I-10

Flooding from Hurricanes

67. The study area is subject to hurricane surges, tides and wave action, as well as winds, and has experienced damages to developments near the coast when hurricanes pass near the area. Flooding from hurricane surges is generally limited to the area south of Doubloon Bayou according to the Flood Insurance Maps by FEMA. Hurricanes have caused no real problems in the Slidell area in the recent past. Hurricane Camille in 1969 caused some damages in the Pearlington area, primarily because of 6- to 9-foot tides. Pearlington is within the hurricane surge area according to the FEMA maps, but experiences some limited protection by US 90 acting as a barrier. Hurricane surges control the flood elevations for the Pearlington area. The April 1983 (200-year) flood would correlate with approximately 25- to 50-year hurricane surge in the Pearlington area.

68. The need exists to prevent flooding to homes, businesses, roads and bridges, and public facilities. There also exists a need to prevent the anxiety and trauma that result from any significant rise on the Pearl River that could result in damages in the area.

SOCIAL

69. The primary social impacts in the project area are associated with the flooding of residential structures. There are approximately 1,400 structures located in the area between Military Road and north of I-10. Of this total, 465 structures are located in the 100-year flood plain under without-project conditions. In the area south of I-10 and east of Military Road and US 190, approximately 1,800 of the nearly 4,600 structures in the area are located in the 100-year frequency flood plain under without-project conditions.

70. During the April 1983 flood, approximately 700 to 800 homes were flooded. These figures would have been higher without floodfighting efforts. Many of these families have returned to their homes after this flood and previous floods to find their homes and furnishings ruined or damaged. As a result, these families experienced undue hardship and mental anguish. The need exists to prevent this type of repeated human suffering.

FISH AND WILDLIFE

71. Due to the increased urban environment, suitable habitat for fish and wildlife is being reduced. As urban growth continues in the study area, fish and wildlife habitat areas may be further reduced unless preservation measures are undertaken by local interests. It has been noted that no endangered, threatened, or proposed species or their habitat will be impacted by a project. It is recognized that there is a bald eagle nesting site and a heron rookery in the area. The need exists to protect and enhance fish and wildlife habitat.

RECREATION

72. There is a need to provide the local citizens of the study area opportunities to participate in nonconsumptive uses of the area's natural resources such as hiking, picnicking, nature photography, birdwatching, canoeing, nature trails, etc. Such recreational areas could be developed in conjunction with the selected plan for providing flood protection to the area.

PLANNING OBJECTIVES

73. Planning objectives stem from national, state, and local water and related land resource management needs specific to the Slidell and Pearlington area. These objectives have been developed through problem analysis and an intense public involvement program and have provided the basis for formulation of alternatives, impact assessment, evaluation, and selection of a recommended plan. The planning objectives are as follows:

a. Develop a comprehensive flood damage prevention plan that would reduce flood damages by providing a higher level of flood protection and reduce the threat to public health and safety.

b. Relieve human suffering, anxiety, and the interruption to daily activities caused by the flooding.

c. Minimize to the extent possible the decline of fish and wildlife habitat in the area.

PLANNING CONSTRAINTS

74. Alternative methods for reduction of flood damages in the Slidell and Pearlington area were limited by the terrain, environment, and the type of flooding that has occurred.

75. Another constraint was the effect the highway modifications being considered by LDOT at I-10 and US 90-190 would have on the levee design and costs and benefit analysis. This constraint is discussed in detail as a part of the technical criteria used in formulating the various plans.

FORMULATION OF PRELIMINARY PLANS

76. The plan formulation analyses conducted to select a plan to resolve the problems and fulfill the needs in the study area are summarized in this section. The following paragraphs present the evaluation criteria used in formulating a plan, alternative solutions considered, and the procedure used to eliminate alternatives.

FORMULATION AND EVALUATION CRITERIA

77. Alternative plans were formulated and evaluated in accordance with various technical, economic, environmental, and socioeconomic criteria. When applied, these criteria provide the means for responding to the problems and needs of the area by selecting a plan in the best public interest, consistent with other developments in the area, and for developing an economically feasible solution.

78. Federal policy on multiobjective planning, derived from both legislative and executive authorities, establishes and defines the national objectives for water resource planning, specifies the range of impacts that must be assessed, and sets forth the conditions and criteria which must be applied when evaluating plans. Plans must be formulated considering benefits and costs, both tangible and intangible, and effects on the environment and social well-being of the community.

79. Plan formulation criteria include published regulations and principles adopted by the Water Resources Council (WRC) and implementing regulations developed by the Corps of Engineers. Other criteria used are in compliance with WRC's Principles and Guidelines (P&G), the National Environmental Policy Act (NEPA), and Executive Orders 11988 and 11990.

Technical Criteria

80. The following technical data and criteria were adopted in developing the plans.

a. Preliminary levee plans presented at the June 1984 public meeting were evaluated to provide 100-year and SPF protection with no improvements to the highways. This allowed each plan to be evaluated at a level that would maximize benefits over costs. The plans that were feasible from this evaluation were carried forward into the final array.

b. I-10 and US 90-190 will require modifications to prevent the overtopping that has occurred in the last several years. The LDOT has, in cooperation with FHWA, contracted with USGS to conduct model studies for the I-10 crossing of the Pearl River flood plain. This study revealed the need of an additional 1,000-foot bridge opening to be added and some clearing around the other bridges and relief openings within the highway right-of-way. Studies are ongoing on US 90-190 crossings within the flood plain. The data results from these studies are summarized in a letter from LDOT dated 21 June 1985 (see Attachment 1).

c. The plans carried into the final array were reevaluated based on the target backwater reductions LDOT would achieve with improvements at I-10 and US 90-190. Results of evaluation of the plans with highway improvements were that the benefit analysis changed, but costs remained essentially the same. This is due in part because highway improvements only lowered the water surface profile from 0 to approximately 1 foot, which reduced the material required for levee embankment by only a very small amount. Also, one of the primary costs of the levee was for lands and this item remained nearly the same.

d. Final plans were evaluated to provide protection from 100-year, 200-year, and SPF flood events. This array of alternatives allows the selection of the plan that would maximize net benefits.

e. Several different size pump stations were sized at each location to ensure selection of a pump that would maximize net benefits. Levee alignments that required more than one pumping station were analyzed with all possible combinations of pump sizes at the various stations to determine the combination of pumps that maximize net benefits.

f. Borrow areas were evaluated both onsite and offsite because of the high cost of real estate in the Slidell area.

g. The economic life of the project was assumed to be 100 years.

h. Adequate flood protection should be provided while minimizing energy consumption.

i. Pumping will be initiated only when the Pearl River stages exceed interior ponding stages. Whenever interior ponding stages exceed river stages, gravity flow will be utilized to evacuate interior runoff.

j. Levee alignments shown on maps indicate the possible line of protection to be afforded an area. In some reaches of the proposed levee alignments, natural ground may be sufficient in height such that a levee will not be required; however, access would be necessary during floodfighting activities. The exact location of the levees will be determined from detailed engineering and design studies and coordination with the local sponsor.

k. Freeboard is required on all levees and is usually 3 feet in height. However, if the natural ground elevation exceeds the design water surface profile by 1 foot or more, no levee will be required. Due to limited survey data, levee costs are based on 3 feet of freeboard throughout the entire levee system.

l. Floodwalls may be required in locations where right-of-way requirements are not adequate or where the relocation of structures exceeds the cost of the floodwall.

m. All major and minor structures are equipped with gates that will be closed only as required to prevent interior flooding from high stages on the Pearl River.

Economic Criteria

81. Economic criteria for formulation of the plans are summarized as follows:

a. The benefits and costs should be expressed in comparable terms as fully as possible. All evaluations of alternatives were based on October 1985 prices, an interest rate of 8-5/8 percent, and a 100-year project life for flood control alternatives.

b. Each alternative considered in detail must be "justified" in that total beneficial effects (monetary and nonmonetary) associated with the objectives are equal to or exceed the total adverse effects (monetary and nonmonetary) associated with the objectives.

c. The maximization of net benefits should be determined in sizing a project; however, environmental quality and intangible considerations could dictate a project larger or smaller in size which would forego some of the net tangible benefits.

d. Project benefits should be based on analyses of with- and without-project conditions, using methodology described in Corps regulations.

Environmental Criteria

82. The following environmental criteria are applicable to the formulation and evaluation of plans:

a. Plans should be formulated to the extent practicable to preserve or improve the quality of the natural environment, specifically fish and wildlife, vegetation, land, air, water, open space, and scenic and esthetic values.

b. The relationship of the proposed action to land use should be considered, and the environmental impact of any proposed action should be evaluated. Any adverse environmental effects which could not be avoided, if a proposal were implemented, should be identified; alternatives to such proposed action should be identified; the relationship between local short-term uses and the maintenance or enhancement of long-term productivity should be determined; and any irreversible and irretrievable commitment of resources involved if a proposed action were implemented should be identified.

Socioeconomic Criteria

83. The following socioeconomic criteria are applicable in this study.

a. Consideration should be given to evaluating and preserving historical, archeological, and other cultural resources.

b. Consideration should be given to safety, health, community cohesion, and social well-being.

c. Displacement of people by the floods and/or the project should be minimized to the extent practicable.

d. Improvement of leisure activities and public facilities should be evaluated.

e. Effects of a project on regional development, including income, employment, business and industrial activity, population distribution, and desirable community growth, should be considered.

f. General public acceptance of possible plans should be determined by coordination with interested Federal and non-Federal agencies, various groups, and individuals by means of public meetings, field inspections, informal meetings, letters, and other public involvement procedures.

g. The plans should be implementable considering the present and potential constraints of the local sponsoring agency in regard to its structure, function, relationships, and associations in the study area.

PRELIMINARY SCREENING

84. A broad range of flood damage prevention measures were considered in the screening process. These alternatives were developed and evaluated by an interdisciplinary team of planners representing disciplines such as engineering, hydrology and hydraulics, socioeconomic, and environmental. Each of the alternatives was developed through a multiobjective process to satisfy the specific needs identified in this report.

85. The affected public provided assistance in identifying a range of alternatives to be evaluated. Alternatives investigated to provide flood protection to the Slidell and Pearlington areas include nonstructural alternatives and structural measures--levees with gravity outlets (floodgates) and pump stations. These alternatives are discussed in the following paragraphs.

Nonstructural Alternatives

86. All practicable nonstructural measures to reduce flood damages were considered in the early screening of alternatives. While some were eliminated during early formulation of alternatives, others were carried through detailed evaluation to determine if a combination of structural and nonstructural measures would, in fact, comprise the best solution for the overall project area.

87. Basically, there are two types of nonstructural measures for flood protection--those which reduce existing damages and those which reimburse for existing damages and reduce future damage potential. Those nonstructural

measures which reduce damages and were investigated to varying degrees in this study include the following:

a. Floodproofing by waterproofing of walls and openings in structures.

b. Raising structures in place.

c. Constructing walls or levees around structures.

d. Permanent evacuation of flood plain.

(1) Relocate structures and contents to flood-free area.

(2) Relocate contents and demolish structures. Provide replacement housing.

(3) Flood forecasting and warning systems with temporary evacuation.

88. Nonstructural measures which compensate or reimburse for existing damages and/or reduce future damages include:

a. Acquisition of flood-prone property.

b. Flood plain regulation by zoning ordinances, regulations, and building codes.

c. Flood insurance.

89. Residential, commercial, and public structures in the flood plain are primarily slab-on-grade construction. Raising such structures through normal jacking procedures is impractical; therefore, two of the previously identified measures--raising structures in place and relocating structures outside the flood plain--were screened from further consideration.

90. The other two items under floodproofing--waterproofing of walls and the construction of walls or levees around structures--were analyzed. It was determined that the cost to accomplish either of these methods far exceeded the cost of providing structural protection to the entire area. Therefore, the alternatives were screened from further study.

91. The remaining nonstructural measures were screened from further consideration because they were not applicable or had already been accomplished in the area.

92. The costs and benefits for various nonstructural measures evaluated for Slidell, Pearl River, and Pearlington are summarized in Table 7. It should also be noted that as a result of the Board of Engineers for Rivers and Harbors review of this report, additional nonstructural alternatives were evaluated (i.e., nonstructural plans providing 50-year level of protection for existing structures and nonstructural plans to provide 200-year and Standard Project Flood protection to future structures built in the flood plain). The results of these analyses are presented in Appendix B, Economic Analysis.

TABLE 7
SUMMARY OF NONSTRUCTURAL MEASURES
100-YEAR PROTECTION
EXISTING CONDITIONS WITHOUT PROJECT

Item	No. of Structures	First Cost	Annual Cost	Annual Benefits	Benefit-Cost Ratio
		($000)	($000)	($000)	
Slidell (South of I-10)					
Floodproofing	666	9,535	813	297	0.4
Structure Raising	1,079	14,842	1,266	538	0.4
Small Walls	698	7,950	677	357	0.5
Relocations	1,085	31,492	2,686	350	0.1
Acquisition/Demolition	677	48,198	4,110	229	0.1
Slidell (North of I-10)					
Floodproofing	220	3,335	292	100	0.3
Structure Raising	346	5,283	463	153	0.3
Small Walls	237	2,895	254	132	0.5
Relocations	346	11,182	980	68	0.1
Acquisition/Demolition	237	17,434	1,538	56	0.0
Cobb-Hammock Area					
Floodproofing	3	11	0.9	0.07	0.1
Structure Raising	4	16	1.4	0.2	0.1
Small Walls	3	7	0.6	0.07	0.1
Relocations	4	55	4.7	0.1	0.0
Acquisition/Demolition	2	24	2.0	0.02	0.0
Pearl River Community					
Floodproofing	26	288	25	11	0.4
Structure Raising	39	418	36	16	0.4
Small Walls	27	220	19	12	0.6
Relocations	39	1,023	87	11	0.1
Acquisition	27	1,232	105	9	0.1

TABLE 7 (Cont)

Item	No. of Structures	First Cost	Annual Cost	Annual Benefits	Benefit-Cost Ratio
		($000)	($000)	($000)	
Pearlington (South of US 90) [a]					
Floodproofing	57	842	72	24	0.3
Structure Raising	92	1,550	132	89	0.7
Small Walls	58	659	56	25	0.5
Relocations	92	3,224	275	50	0.2
Acquisition/Demolition	73	4,942	421	50	0.1
Pearlington (North of US 90) [a]					
Floodproofing	276	3,038	259	71	0.3
Structure Raising	338	4,842	413	178	0.4
Small Walls	285	2,342	200	79	0.4
Relocation	338	11,483	979	97	0.1
Acquisition/Demolition	302	14,333	1,222	95	0.1

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[a] The 100-year stillwater hurricane surge elevation was used to evaluate nonstructural measures for the Pearlington area. Benefit-cost ratios were so far below unity that lower levels of protection were not evaluated. In addition, most of the nonstructural measures evaluated for Pearlington would not be very practical for preventing hurricane-induced flooding because of associated high winds and wave action.

Structural Alternatives Evaluated

93. The structural plans evaluated for the Slidell and Pearlington flood control study consisted of ten levee plans with the appropriate appurtenant structures required to remove interior drainage, one channel cleanout plan, and highway modifications. Levees which provided 100-year protection or greater were evaluated in detail with lower levels of protection dropped in the initial screening. Lower levels of protection would not be locally acceptable in light of the record flood in April 1983 which approximates a 200-year flood event. In addition, costs for pumping plants, floodgates, and drainage structures, which comprise a large portion of the project costs, would be relatively fixed costs regardless of the level of protection evaluated. Due to the nature of the flood plain and existing structure elevations, providing levels of protection less than 100 years would significantly reduce benefits with only small reductions in costs.

94. Plan A.

a. Plan A is a levee plan which was developed to provide protection to the Slidell area north of I-10 and east of Military Road (Plate J-11). It is essentially the alignment presented for evaluation by the Military Road Alliance (MRA) after the April 1983 flood.

b. The levee begins northwest of Whiskey Island and runs east to where the upland ridge area is defined from the actual flood plain. It then turns in a southerly direction and follows the upland ridge area, crossing Gum Bayou and terminating at a point near Crawfords Landing. It is primarily located as close as possible to the upland ridge line. In some isolated cases, residences are located so close to the upland ridge line that it may become necessary to either relocate the structure or build a floodwall in lieu of a levee to provide the protection, whichever is cheaper. In other situations, it may become necessary to place some structures outside the protected area, but in this case every attempt will be made to route the levee or floodwall to encompass as many structures as possible.

c. This plan consists of a levee approximately 4.5 miles in length, a pumping station with a gravity outlet structure (i.e., major floodgate) located on Gum Bayou, and eight minor structures to remove interior drainage. This plan provided protection to the following subdivisions: Ravenwood, Morgan Bluff Estates, Magnolia Forest, River View, Timberlake, Honey Island, Hickory Hills, and River Gardens.

d. Preliminary analysis of this alternative revealed that it was feasible; therefore, it was carried into the final array.

95. Plan B.

a. Plan B, as shown on Plate J-12, is a ring levee that encircled and protected the same area as Plan A. It begins in the vicinity of Whiskey Island, running eastward until it intersects the upland ridge area. From this point it follows the upland ridge area as Plan A did until it intersects Gum Bayou. From that point it turns and follows the top bank of Gum Bayou until it intersects the point of beginning.

b. This plan, with an estimated first cost ranging from $12 to $14 million, consists of a levee approximately 8.7 miles long, a pump station with a gravity outlet structure to be located in the River Gardens area and 12 minor structures to remove interior drainage. The annual benefits and costs were estimated at $800,000 and annual costs varied from $1.0 to $1.2 million. The benefit-cost ratios ranged from 0.7 to 0.8. This plan was not economically feasible and was eliminated from further study.

96. Plan C. Plan C is a levee plan developed to protect the Cross Gates and River Crest Subdivisions of Slidell which are located just south of I-10 and east of Military Road (Plate J-13). This plan was also presented by the MRA. It begins at a point where the upland ridge area intersects I-10, running along the upland ridge in a southerly direction, but turns west in the vicinity of Devil's Elbow and intersects higher ground elevations in the vicinity of Military Road. This plan, with an estimated first cost ranging from $2 to $3 million, consists of a 1-mile-long levee and a pump station with a gravity outlet structure to remove the interior drainage. The annual benefits were estimated at less than $70,000 with annual costs more than $180,000 and a benefit-cost ratio of less than 0.4. This plan was not economically feasible and was eliminated from further study.

97. Plan D.

a. Plan D is a comprehensive levee plan for the Slidell area south of I-10 and east of US 90-190 (Plate J-14). It begins in the vicinity of the upland ridge area and I-10 and runs in a southerly direction following the upland ridge area until it crosses Doubloon Bayou near the River Oaks Subdivision. It then encircles that subdivision following the top bank of the West Pearl River before it turns southwest and intersects with US 190 in the vicinity of Belle Acres. It then turns in a northwestward direction crossing Doubloon Bayou and intersects US 190 approximately 5 miles east of I-10.

b. This plan consists of a levee approximately 10 miles in length, two pump stations with gravity outlet structures, and four minor structures. The pump stations are located in the area south of the Cross Gates Subdivision and on Doubloon Bayou. The pump station on Doubloon Bayou is considerably larger than the one south of the Cross Gates Subdivision area. The locals requested that the Corps evaluate a navigable floodgate to be installed on Doubloon Bayou to allow boat access from Doubloon Bayou to the West Pearl River. The subdivisions protected include Cross Gates, River Crest, Holly Ridge, River Oaks, Indian Village, Belle Acres, Tammany Trailer Park, Beverly Heights, Ozone Air, French Branch Estates, Frenchmen's Estates, Doubloon Bayou Estates, Quail Ridge, The Settlement, Abney Country Aire, Pearl Acres, Pennydale, and Lake Village.

c. This plan appeared feasible and was carried into the final array of alternatives.

98. Plan E.

a. Plan E also addresses the area south of I-10, but protects existing developed areas only (except for River Oaks and Indian Village Subdivision), leaving large undeveloped areas outside the levee (Plate J-15). This alignment protects the flood plain from additional encroachment and does not benefit further development. The levee begins in the vicinity of the upland ridge area south of I-10 and proceeds in a southerly direction to a point just south of the Cross Gates Subdivision where the alignment turns west, running until it is in the vicinity of Military Road. It then parallels Military Road until it intersects French Branch and parallels it to the intersection of Old River Road. It then parallels Old River Road east until it intersects the upland ridge line near the banks of the West Pearl River. From that point, it turns in a southerly direction following the upland ridge line until it intersects Doubloon Bayou. After crossing Doubloon Bayou, it continues in a southerly direction until it passes Belle Acres Subdivision. Turning west and crossing US 190, the levee crosses Doubloon Bayou again and finally intersects US 190 approximately 0.5 mile east of I-10.

b. This 10.5-mile-long levee will have two pump stations with gravity outlet structures and six minor structures to remove interior drainage. This plan protects the same areas as Plan D except for the River Oaks and Indian Village Subdivisions.

c. This plan was economically feasible and was carried into the final array of alternatives.

99. Plan F. This levee, put forth by the MRA, was developed to protect the Cobb-Hammock area of Slidell located just north of the intersection of Military Road and I-59 (Plate J-16). This plan, with an estimated first cost ranging from $2 to $3 million, consisted of a levee approximately 1.3 miles long and one major pump station with a gravity outlet structure to remove interior drainage. The levee which encircles the Cobb-Hammock area and intersects higher elevations along I-59 would provide protection from the Pearl River flows that flow through Porters River and through the area. The annual benefits were estimated at $50,000 with annual costs of more than $180,000 and a benefit-cost ratio of less than 0.3. This plan was not economically feasible and was eliminated from further analysis.

100. Plan G.

a. This 1.3-mile levee plan was developed to provide protection to the town of Pearl River, Louisiana, from backwater of the Pearl River flowing through Gum Creek (Plate J-17). Pearl River, Louisiana, is located in the area north of Slidell and west of I-59. The I-59 bridge embankment and the railroad affect stages on Gum Creek. The MRA requested the evaluation of this levee not only because of flooding experienced in Pearl River, Louisiana, but waters from Gum Creek were reportedly flowing into Gum Bayou and raising river stages in that area. This proved to be unfounded by surveys.

b. The levee followed an old abandoned railroad from a point on the south side of Pearl River and I-59 in a northerly direction crossing Gum Creek and intersecting higher ground.

c. This levee, with an estimated first cost ranging from $3 to $10 million, would be approximately 1.3 miles long and have one major pump station with a gravity outlet structure to remove interior drainage. Annual benefits were estimated at $20,000 and annual costs varied from $270,000 to $870,000. The benefit-cost ratio was less than 0.1. This plan was not feasible and was eliminated from further analysis.

101. Plan H.

a. This levee plan was developed to provide protection to the Slidell area south of I-10 (Plate J-18). It provided protection to more structures than Plan D or E. This plan was developed by the MRA following the June 1984 public meeting because it considered this plan to be more acceptable than Plan D since it did not include the River Oaks or Indian Village Subdivisions. In addition, locals considered this plan more acceptable than Plan E because it protected more structures from Pearl River flooding and crossed Doubloon Bayou only once.

b. The levee begins on the upland ridge area near I-10 and runs south along the upland ridge line. It then turns west just below the Cross Gates Subdivision and follows the old levee in that area until it terminates near the vicinity of Military Road. This portion of the plan is similar to Plan C. The levee would then resume at the French Branch bridge on Military Road and parallel French Branch until it intersects Old River Road, where it would then turn east and parallel Old River Road until it intersects the upland ridge area near the Quail Ridge Subdivision and terminates. The levee would then resume south of Quail Ridge and run in a southerly direction, crossing Doubloon Bayou until it intersected higher ground at the intersection of US 90-190.

c. Plan H was an intermittent levee system that did not include freeboard and by Corps standards, this plan would not provide protection from the major flood events. In addition, this plan would conflict with the highway mitigation measures for US 90-190 being considered by LDOT. For these reasons, this plan was eliminated from further consideration.

102. Plan I. This 6.8-mile levee plan was developed to provide protection to the area north of US 90 in Pearlington (Plate J-19). This levee was to encircle the area north of US 90 and encompass most of the structures except the ones located too close to the East Pearl River or along an inlet off the East Pearl River. It would require several pump stations with gravity outlet structures and numerous minor structures to be an effective system. The levee would also be required to have additional freeboard above the level normally required because it would be located within the hurricane surge area. The estimated first costs for this levee plan would range from $11 to $19 million with annual costs ranging from $960,000 to $1.7 million. Assuming 100 percent of the existing flood damages were prevented (i.e., less than $200,000 annually if both hurricane surge and East Pearl River flood damages are included), this levee plan would have a benefit-cost ratio of only 0.2. It was therefore eliminated from further consideration. The Pearlington area south of US 90 does not lend itself to any type of levee system because of the many bayous and inlets and their close proximity to the structures. Also, a levee for this area would not be locally acceptable since it would block boat access to the East Pearl River.

103. Plan J.

a. The Military Road Alliance at the April 1985 public meeting requested that this plan (Plate J-20) be evaluated. This plan was similar to Plan H (Plate J-18), but the levee alignment was adjusted to reduce the potential environmental impacts and to avoid a conflict with the highway mitigation measures at US 90-190 being considered by LDOT. Also, this plan was upgraded to the same design standards and criteria used in evaluating the other levee plans.

b. At this public meeting, local interests indicated that they preferred Plan J because it would cost less than Plan E, would provide headwater protection to a larger area south of I-10, and would cross Doubloon Bayou only once. The disadvantages of Plan J are that this plan would not provide protection from hurricane flooding and could cause some secondary environmental impacts to Fritchie Marsh by blocking sheetflow from the Pearl River during headwater flood events. In addition, during a 50-year flood event or greater, this plan would cause an increase in Pearl River flood stages below I-10 and above US 90 due to the loss of Fritchie Marsh as a flood storage area. For example, this plan would cause stage increases between 0.2 and 0.4 foot for the April 1983 flood event.

c. Plan J begins in the vicinity of the upland ridge area south of I-10 and follows the same alignment as Plan E to just below Belle Acres Subdivision. At that point, the levee parallels US 190 in a southeasterly direction down to Apple Pie Ridge where it crosses US 190 and continues down Apple Pie Ridge and ties into US 90.

d. This plan consists of a levee approximately 8.4 miles long, one pumping station with a major gravity outlet structure located south of Cross Gates Subdivision, one major gravity outlet structure on Doubloon Bayou, and nine minor drainage structures. The subdivisions protected from headwater (river) flooding include Cross Gates, River Crest, Belle Acres, Tammany Trailer Park, Beverly Heights, Ozone Air, French Branch Estates, Doubloon Bayou Estates, Abney Country Aire, Pearl Acres, Pennydale, Lake Village, Frenchmen's Estates, Quail Ridge, The Settlement, Avery Estates, and the Apple Pie Ridge area. However, many of the above subdivisions are subject to hurricane surges and would not be protected by the Plan J levee alignment. Preliminary analysis indicated that this plan was economically feasible; therefore, a detailed evaluation was conducted.

104. Channel Cleanout. Channel cleanout or dredging on the East and West Pearl Rivers was not a viable solution to flooding because of the high costs involved in relation to the reduction in river stages that could be obtained. The Mobile District evaluated this alternative in the 1980 Pearl River Basin reconnaissance report and found it to be infeasible. It was determined that dredging could possibly reduce river stages in minor flood events, but provided no measurable reductions in river stages for major floods. To demonstrate this ineffectiveness, the Mobile District did some preliminary calculations on the 1980 flood event. In 1980 the flood produced a gage reading of 19.85 feet, NGVD, on the West Pearl River, a 60-year event. To reduce the stage by only 1 foot, the existing Pearl River channel would have to be increased to 50 feet deep and 200 feet wide, which would result in the removal of 55 million cubic yards of material. The cost to remove such material would be prohibitive even if suitable disposal areas were available. The 1983 flood event produced a gage reading of 21.2 feet, NGVD, and was estimated as a 200-year event. Therefore, achieving any measurable difference in stages would be extremely costly and would not be justified economically or environmentally. Based on the Mobile District's preliminary analysis, channel cleanout was eliminated and no further studies were conducted by the Vicksburg District.

105. Highway Modifications. Highway modifications as a means of providing flood protection to the project area were considered. However, based on the results of studies conducted by USGS in cooperation with LDOT and FHWA, highway modifications at I-10 do not provide sufficient reductions in river stages to eliminate the need for levees. Computed water surface elevation data for the April 1980 flood at various locations along the West Pearl River are shown in Table 8 for several different scenarios. These data were taken from a report prepared by USGS entitled, "Analysis of Alternative Modifications for Reducing Backwater at the I-10 Crossing of the Pearl River Near Slidell, Louisiana." It should be noted that for the West Pearl River, the April 1980 flood approximates the point of maximum backwater effect that could

result from the I-10 embankment. LDOT has indicated that an additional 1,000-foot bridge opening appears to be the best plan for alleviating the overtopping at I-10. LDOT has estimated that an additional 1,000-foot bridge opening would cost between $3 to $4 million and would reduce the backwater effects at Gum Bayou by 0.9 foot as compared to $6 to $8 million for a new 2,000-foot bridge opening which would reduce the backwater effects by 1.1 feet. It is apparent from these data that highway modifications do not provide a solution to the flooding problems in Slidell.

TABLE 8
COMPUTED WATER SURFACE ELEVATIONS FOR APRIL 1980 FLOOD
WEST PEARL RIVER AT I-10
SLIDELL, LOUISIANA

Location	River Mile	Water Surface Elevation, Feet (NGVD)			
		With I-10 Embankment	Without I-10 Embankment	Additional 2,000-Foot Bridge	Additional 1,000-Foot Bridge
Davis Landing	16.7	13.8	12.9	13.0	13.1
River Gardens Subdivision	14.5	12.8	11.4	11.7	11.9
Mouth of Gum Bayou	14.0	12.7	11.3	11.6	11.8

SOURCE: USGS Open-File Report 84-443, "Analysis of Alternative Modifications for Reducing Backwater at the I-10 Crossing of the Pearl River Near Slidell, Louisiana," 1984.

Structural Alternatives Eliminated

106. The levee plans eliminated from further consideration are summarized in Table 9.

TABLE 9
SUMMARY OF LEVEE PLANS ELIMINATED FROM FURTHER CONSIDERATION

Plan	First Cost ($000,000)	Economically Feasible	Environmentally Feasible	Engineeringly Feasible
B	12-15	No	Yes	Yes
C	2-3	No	Yes	Yes
F	2-3	No	Yes	Yes
G	3-10	No	No	Yes
H	Not Developed	Not Developed	Yes	No
I	11-19	No	No	Yes

Structural Alternatives Considered in Final Array

107. Only the four economically feasible levee plans, Plans A, D, E, and J, were carried into the final array. Plan A provides protection to the area north of I-10. Plans D and E provide river and hurricane flood protection to the area south of I-10, while Plan J only provides protection from Pearl River flooding.

ANALYSIS OF PLANS CONSIDERED IN FINAL ARRAY

108. Prior to detailed assessment and evaluation of the four plans carried into the final array, a further screening was conducted. The primary purpose of this screening was to determine the pump sizes or pump combinations that maximized excess benefits over costs. Also, due to the high real estate values in the project area and local opposition to onsite borrow, the costs of using on- and offsite borrow materials for levee embankment were evaluated. In all cases, offsite borrow was found to be the least costly alternative for each plan. Cost comparisons for the 100- and 200-year and SPF level of protection showing the various pump options for both on- and offsite borrow areas are summarized in Appendix E, Tables E-1 through E-15.

109. As a result of this further screening, the number of alternatives in the final array were reduced to 12; i.e., three different levels of protection for each plan.

FEATURES COMMON TO ALL PLANS

110. The plans in the final array of alternatives (Plans A, D, E, and J) are very similar. Consequently, the discussion presented in this section includes general statements which are valid for all plans.

Level of Protection

111. Three different levels of protection were evaluated for each levee plan--100-year, 200-year, and SPF. The 100-year storm is the typical event on which flood insurance studies are computed. The 200-year event was approximately the height of the Flood of Record experienced in April 1983. The SPF represents the flood that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations. It should be noted that Plan J is an open levee system and would not provide protection from hurricane flooding.

Floodgates and Minor Structures

112. All plans evaluated in detail include cost of floodgates in conjunction with the pump stations and minor structures. Floodgates and minor structures are equipped with slide gates which will be closed when the stages on the Pearl River are high enough to cause water to back up into the area. These floodgates and minor structures would be constructed in accordance with standard construction techniques and would allow the maximum amount of water to flow when the slide gates are open. The structures will remain open most of the year which will allow the normal exchange of water to take place.

113. One of the major features of Plan D, which differ from the other plans, is a navigable floodgate that would be installed on Doubloon Bayou to allow boat access into the West Pearl River. This type of floodgate was evaluated at the request of local interests at the June 1984 public meeting. Residents of River Oaks and Indian Village Subdivisions were unanimously opposed to Plan D without this feature. However, from recent coordination meetings with the MRA and St. Tammany Parish Police Jury members, the interest by residents from these two subdivisions has not increased as expected with the navigable floodgate feature.

Pumping Plants and Sump Areas

114. All levee plans carried into the final array required either one or two floodgates and pumping plants to provide adequate protection to the area inside the levee alignments. A minimum of three different size pumping plants was investigated for each sump area. As previously discussed, the floodgate and pump combinations were economically optimized to determine the final array

of alternatives for detailed evaluation. Each pump station requires a certain size sump area to operate effectively. Therefore, prior to initiation of construction, these sump areas would have to be zoned by the local sponsor such that structural development in these areas would be prohibited.

Levees

115. The levees in the Slidell area will have a 10-foot crown with a 6-foot roadway addition. The entire crown width (16 feet) will be graveled in order to facilitate the operation and maintenance of structures and possible flood-fight efforts that could become necessary in the future. Levees that are less than 15 feet in height will require 1 on 3 side slopes on the riverside of the levee, 1 on 4 side slopes on the landside of the levee, and 1 on 3.5 side slopes for the roadway addition. Levees in excess of 15 feet in height will require 1 on 4 side slopes on the riverside, 1 on 5.5 side slopes on the landside, and 1 on 3.5 side slopes for the roadway addition. It is anticipated that levees will be constructed using suitable offsite material. A schematic of a typical levee is shown in Plate J-21. Levees are typically constructed with 3 feet of freeboard. However, if the natural ground elevation exceeds the design water surface profile by 1 foot or more, no levee will be required. All levees will be adequately vegetated when construction is completed and access will be limited by the local sponsor.

Floodwalls

116. Floodwalls are considered a viable alternative to a levee where rights-of-way are limited. The need for floodwalls must be evaluated on a case-by-case basis, and a final determination would be made during detailed engineering and design studies. In order for a floodwall to be justified, it must be cheaper to construct than relocation of the structure. If locals desire a floodwall in a given location that varies from the above policy, then the local sponsor would be responsible for the difference in the cost of the levee and the floodwall. Depending on the location, floodwalls may also require 3 feet of freeboard to adequately protect the area and also to protect the floodwall from possible overtopping and structural undermining.

Offsite Borrow

117. During the 27 June 1984 public meeting, strong opposition was expressed to the proposed location of the borrow areas. The objections were that the borrow areas required the remainder of the higher elevation lands in and along the levee alignment. The locals contend that this would be the most expensive land to acquire if the owner would be willing to sell. It was explained that the borrow areas were located only by aerial photographs and they would be subject to change when actually located on the ground and actual soil borings were obtained for each area. Because of the high land costs in the project

area, the Vicksburg District also investigated the possibility of offsite borrow areas. Offsite borrow areas were located by contacting several commercial borrow pit owners. Based on information received from these commercial owners, it appears the material will be suitable for levee construction. Price quotes were received from the owners as to the price per cubic yard of material hauled, processed, and placed on the site. A comparison was then made of onsite and offsite borrow areas. This comparison showed that offsite borrow areas would be the least costly alternative for each plan. Therefore, it was decided that because of the cost and the local acceptability of offsite borrow areas, the levees would be analyzed reflecting the offsite borrow areas.

IMPACT ASSESSMENT

118. Plans A, D, E, and J, which were carried into the final array, provide to varying degrees a solution to the flooding problems in the area; however, plan selection must be based upon an analysis of the significant impacts resulting from implementation of a particular plan. Impact assessment is an objective analysis conducted to identify and measure the economic, social, environmental, hydrologic, and cultural impacts expected to result from implementation of alternative plans. These impacts form the basis for analyzing the beneficial and adverse contributions of the plans during evaluation and plan selection. Each of the alternatives in the final array are analyzed in relation to the without-project conditions to determine the expected changes.

119. Installation of water resource improvement plans considered will have effects upon the economic, social, and environmental structure of the project area. Effects will vary between the construction and postconstruction period as well as between areas during the construction period. People and operations located in or near immediate areas of levee and pump construction will be affected to a greater degree than people and operations located in the remainder of the project area.

System of Accounts

120. Four accounts, the National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE), are used in organizing the information on impacts. These four accounts encompass all significant effects of a plan as required by the National Environmental Policy Act of 1969 and social well-being as required by Section 122 of the Flood Control Act of 1970. The NED account shows effects

on the national economy. The EQ account shows effects on ecological, cultural, and esthetic attributes of significant natural and cultural resources that cannot be measured in monetary terms. The RED account shows the regional incidence of NED effects, income transfers, and employment effects. The OSE account presents the urban and community impacts and effects on life, health, and safety. The System of Accounts format is integral to the planning process and provides information for use in trade-off analysis and decisionmaking.

121. National Economic Development (NED). The recommended improvement affects NED from both beneficial and adverse standpoints. It benefits the NED account through the prevention of flood damages, enhancement of resources, and increased employment and business activities resulting from construction activities. The effects are reflected in increased value of output of goods and services. Adverse effects to NED include the value of resources required for project construction, operation and maintenance, and losses of net income to project lands. Net benefits, used herein as the standard of evaluation, represent the excess of annual benefits over annual cost.

122. Environmental Quality (EQ). Since Plans A, D, E, and J are located in the same general area, the primary impacts associated with development are similar in nature, but secondary impacts could differ appreciably. Those impacts are summarized in the following paragraphs.

a. The primary environmental effects of each of the plans would result from the placement of levee material.

b. The construction of the alternatives would not have any significant adverse effects on air pollution in the area. Some temporary pollution would be generated by the construction activity.

c. Wildlife of the area would be adversely affected by the construction activities. It is assumed that wildlife inhabiting the agricultural, wooded, and grassland areas affected by construction would be eliminated. Minimal losses of animals and birds may be incurred.

d. No significant long-term effect on the fish population of the Pearl River, Gum Bayou, or Doubloon Bayou is expected. Construction operations will adversely affect water quality during construction, and the fish population concentrated in the construction area may be expected to diminish.

e. Plan E is the least environmentally damaging of all the plans studied in detail. It was sited with input from FWS and LDWF to minimize adverse impacts to wooded wetlands and marsh areas by avoidance where possible.

f. Both Plans D and J would protect larger areas south of I-10, but in contrast, this protection would result in adverse secondary impacts. Plan D would enclose large areas of undeveloped forested and wooded wetlands. Plan J would essentially dissect the ecologically significant West Pearl flood plain from Fritchie Marsh.

123. Other Social Effects (OSE). Assessment of the impacts on the social effects of the area residents is qualitative rather than quantitative. The only significantly impacted parameter under this category is esthetics. Under all plans considered, levee construction would result in the removal of some natural vegetation and restrict direct view of the river in certain areas. Also, Plan D would cut off two subdivisions that have direct boat access to the West Pearl River. Unanimous opposition to Plan D was expressed by residents of these two subdivisions at the June 1984 public meeting.

124. Regional Economic Development (RED). Parameters such as employment, income, desirable regional growth, property values, local government finance, and business and industrial activity are expected to benefit as a result of project implementation. Minor adverse effects were identified in the displacement of public facilities and services and tax rate parameters. At best, some increase is expected in local tax rates and such increases will not be favored by all citizens. Increases and stimulants in parameters as noted above are consistent with local and regional development plans and reflect desirable influence in existing regional conditions.

Economic Analysis

125. National Economic Development (NED). NED concerns changes in the national output, an output which is partly reflected in a national product and income accounting framework designed to measure the flow of goods and services in the economy. The component parts of NED evaluated are the value to users of outputs of goods and services and the value of resources required for a plan. The evaluation of economic development (efficiency expressed in terms of net benefits) is used herein as the standard of evaluation. Net benefits, excess annual benefits over annual costs, would be provided by all plans evaluated. Total costs include the value of resources required for project construction and operation and maintenance.

126. Property Values. Project construction is expected to have both beneficial and adverse effects on property values. Urban property values in study area subdivisions would probably increase somewhat due to the flood protection provided or by the knowledge of future protection. Property values on rights-of-way land would be reduced. Overall, the impact should be beneficial.

127. Windfall Benefits. Consideration was given to the possibility of providing windfall benefits to the owners of undeveloped land within areas protected by the levees. However, based on coordination with St. Tammany Parish officials, the levee Plans A and E would provide protection to only three tracts of land where different individuals own more than 20 acres. These three tracts total 80, 160, and 380 acres, respectively. The larger tract represents only 5 percent of the total area protected by the project and less than 5 percent of the total project benefits. The primary benefit derived

from providing levee protection to undeveloped lands would be the reduction in floodproofing costs for construction of future structures (i.e., residential site benefits). However, these benefits are broad and widespread and would eventually be passed on to some 2,800 families who construct new homes in the area protected by levee Plans A and E. Based on these factors, it was determined that windfall benefits would not be provided with implementation of these levee plans.

128. Employment and Labor Force. Employment opportunities would be created by project construction and increased demand for inputs used in construction. However, these employment opportunities would be of a shortrun nature and, with the exception of project operation and maintenance jobs, would not contribute to the sustained growth of employment within the project area.

129. Business and Industrial Activity. Demands for inputs and goods and services during project construction would create a minor stimulant for the general economy of Slidell and St. Tammany Parish.

130. Public Facilities. Implementation of water resource improvement plans would necessitate the relocation of a number of utility lines to include powerline, telephone line, gasline, waterline, and sewerline crossings. These relocations would take place during the construction period and are not expected to create any major adverse effects.

131. Long-Term Impacts on Nonprotected Areas. The location of the project is such that if implemented, only a small amount of developable land would remain outside the protected area. This is due to the fact that the project borders the Pearl River WMA where development is prohibited and most of the remaining lands are classified as wetlands. All new development is required by the local government to be elevated above the 100-year base flood elevation. Therefore, no additional Federal flood control projects would be anticipated for this area since this project would not induce development outside the protected area.

Social Analysis

132. Displacement of People. Any displacement of homes and people will be contingent upon the final levee alignments. The final alignment will be determined during the detailed engineering studies after additional soil borings have been taken, additional surveys, and public involvement. Based on the above information, impacts to homes and families will be avoided whenever possible or kept to an absolute minimum.

133. Community Cohesion. During the construction period, community cohesion within the construction area is expected to suffer adverse effects. Residents in the project area understand the need for and desire flood control measures.

However, animosity could develop among those people who must unwillingly yield their land for rights-of-way requirements. Once construction is completed on any plan, the adverse effects on community cohesion are expected to diminish, and in the longrun, the community will be strengthened by the security and development potentials provided by flood protection.

134. Noise. Noise created by project construction will be a nuisance. The construction area will bear the impact of these noises. Although contractors will be expected to make every possible effort to reduce and control the duration and degree of noise, the effect can only be considered adverse. A similar impact can be expected to prevail during periods when maintenance operations are required.

135. Esthetic Values. Excavated material, construction materials, and unsodded levees will be displeasing sites in the construction area during project construction. The selected plan of solution includes shaping and seeding of project levees in the construction area. Once construction is completed and vegetative life recovers in construction areas, esthetic values will be somewhat restored or improved. Esthetics within the project area could be improved due to the fact that a more permanent type environmental equilibrium would be created due to less frequent flooding.

Environmental Analysis

136. Water Quality. Minor effects on water quality will result as a direct effect of levee construction; some increased turbidity can be expected. After project construction, some increased turbidity can be expected when the pumps are in operation, but this turbidity will dissipate quickly downstream. Minimal effects to the fisheries are expected.

137. Air Quality. Construction of project features of any of the alternatives would directly influence air quality from open air burning of vegetation or debris, addition of dust from heavy equipment operation, and emissions from internal combustion engine exhausts. The use of chemical or organic fire starters would add to these combustion residues. The magnitude of any of these effects on the climatological environment, whether permanent or temporary, is not known.

138. Sociocultural Elements. The selected plan of improvement will have a number of effects on the sociocultural environment in the project area. In general, the project will improve living conditions by lessening the dangers, expense, and inconveniences of flooded streets and homesites. The project will reduce dangers to public health and safety by reducing the adverse effects of floods on sewerage and drinking water facilities. Previous drainage works have also aided in reducing many of the health problems associated with mosquito-borne diseases.

Hydrologic Analysis

139. At the June 1984 and April 1985 public meetings, locals expressed concern that levees protecting the Slidell area north and south of I-10 would raise river stages in the unprotected areas. Studies by the Vicksburg District indicate that levee plans such as Plans A, D, and E would have no measurable impact on flood stages on the East or West Pearl Rivers. The area these levee plans would protect is not part of the effective flow area of the river and serves only as a storage area for backwater flooding. The flood plain for the East and West Pearl Rivers is approximately 4.5 miles wide, and the levees would remove such a small amount of the backwater storage area that the impact on river stages would be immeasurable.

140. During major headwater flood events (i.e., 50-year event or greater), the stages on the West Pearl River are high enough to overtop US 190 between Apple Pie Ridge and Avery Estates and drain into Fritchie Marsh. However, the Plan J levee alignment (see Plate J-20) would prevent the overtopping of US 190, and the resulting loss of Fritchie Marsh as a flood storage area would cause some increases in stages on the West Pearl River between US 90 and I-10. For example, stage increases on the West Pearl River caused by Plan J would be between 0.2 and 0.4 foot at US 90 for the April 1983 flood of record (approximately a 200-year event). Floods of lesser magnitude would produce smaller stage increases with a 50-year flood or less causing no measurable increase in river stages.

Cultural Analysis

141. No sites listed on the National Register or any potentially eligible sites would be impacted by the various levee alignments. However, four cemeteries and two possible historic graves could be impacted by construction activities within the levee rights-of-way. When the exact levee alignments are established during the detailed engineering and design studies, every attempt will be made to avoid impacting these cemeteries. If this is not possible, a recovery program will be initiated or the entire site will be relocated.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

142. Implementation of a levee project will result in the irretrievable and irreversible commitment of some existing resources and the potential for

future use of these resources, at least for the life of the project. Lands committed to rights-of-way or other project features will be removed from their original use, whether woodland, agricultural land, grassland, or streambank. The project will also irreversibly and irretrievably commit any esthetic attributes or natural areas that are changed or removed during project implementation.

143. The implementation of project features will irreversibly and irretrievably commit the labor and materials associated with construction activities. Planning and technical expertise, as well as monetary resources, will be irretrievably committed to the selected plan of improvement.

SYSTEM OF ACCOUNTS

144. Pursuant to Section 122 of the River and Harbor and Flood Control Act of 1970, and in accordance with the Water Resources Council's Principles and Guidelines (P&G) for Planning Water and Related Land Resources, all possible economic, social, and and enviornmental effects relating to any proposed project must be considered. In assessing possible economic, social, and environmental effects of project alternatives for the Slidell-Pearlington area, procedures outlined in P&G were implemented. These procedural guidelines provide a systematic process for determining the effects of project alternatives and require that any effect considered significant be displayed. The quantitative and qualitative presentation and accounting displays included in the effect assessment are intended to satisfy the assessment and display requirements of P&G.

145. Beneficial and adverse contributions identified in each of the four national accounts are summarized and displayed by area of occurrence (see Attachment 2, Tables 1-4).

COMPARISON OF DETAILED PLANS

146. Table 10 compares each of the plans evaluated in the final array. These parameters form the basis for the designation of the NED plan as well as the recommended plan. As a result of the more detailed evaluation of cost and benefits, Plan D was found to be not economically feasible and was eliminated from further consideration.

147. In order to protect the Slidell area both north and south of I-10, a combination of Plan A which protects the area north of I-10 and either Plan E or Plan J which protects the area south of I-10 will be required.

RATIONALE FOR NED PLAN

148. The NED plan addresses the planning objectives in a way which maximizes net economic benefits. The NED plan for the Slidell area north of I-10 is Plan A which provides 200-year protection with a 50-cfs pumping station, a 10- by 8-foot floodgate, and 8 minor drainage structures. The NED plan for the

TABLE 10

COMPARISON OF DETAILED PLANS

(8-5/8 Percent Interest Rate, 100-Year Project Life, and October 1985 Price Levels)

Alternative	Total First Costs	Total Investment Costs a/	Annual Costs	Annual Benefits	Excess Benefits	Benefit-Cost Ratio	Damages Prevented	Existing Structures Protected	Annual Net Fish and Wildlife Losses
	($000)	($000)	($000)	($000)	($000)		($)		($000)
Plan A b/									
100-year	6,803	7,719	721	892	171	1.2	97	465	3.4
200-year (NED)	7,116	8,075	752	933	181	1.2	97	748	3.4
SPF	8,047	9,131	844	949	105	1.1	99	781	3.5
Plan D c/									
100-year	23,516	26,684	2,680	2,530	-150	0.94	95	1,455	+1.2
200-year	24,026	27,263	2,729	2,679	- 50	0.98	99	2,397	0.6
SPF	25,397	28,818	2,864	2,749	-115	0.96	99	2,600	0.8
Plan E d/									
100-year	13,108	14,874	1,390	2,471	1,081	1.8	94	1,339	+0.7
200-year (NED)	13,556	15,382	1,444	2,547	1,103	1.8	95	2,281	+0.6
SPF	14,944	16,957	1,571	2,600	1,029	1.7	95	2,484	+0.4
Plan J e/									
100-year	13,349	15,714	1,464	1,870	406	1.3	67	1,611 f/	3.3
200-year	14,156	16,063	1,494	1,909	415	1.3	68	2,553 f/	3.4
SPF	15,075	17,106	1,584	1,942	358	1.2	69	2,756 f/	3.5

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a/ Includes project first cost and interest during construction.

b/ Includes 50-cfs pump with floodgate.

c/ Includes 250-cfs pump and navigable floodgate at main sump and 15-cfs pump and floodgate at Cross Gates sump.

d/ Includes 250-cfs pump and floodgate at main sump and 15-cfs pump and floodgate at Cross Gates sump.

e/ Does not provide protection from hurricane flooding; includes a major floodgate at Doubloon Bayou and a 15-cfs pump and floodgate at Cross Gates Sump; co include a new bridge at US 90 that could be used to mitigate for stage increases caused by Plan J (see discussion in paragraph 150, page 46).

f/ Includes structures that are not protected from hurricane flooding.

Slidell area south of I-10 is Plan E which provides 200-year river and hurricane protection with 250- and 15-cfs pumping stations, 2 major floodgates, and 6 minor drainage structures.

RATIONALE FOR DESIGNATION OF THE RECOMMENDED PLAN

149. The NED plan is the recommended plan for the Slidell area. The recommended plan consists of Plans A and E to protect the areas north and south of I-10. Both of these plans provide 200-year protection which approximates the April 1983 Pearl River flood of record. In addition, the area south of I-10 is subject to hurricane flooding, and Plan E also provides protection against a 200-year hurricane. In an effort to minimize impacts to wetland areas, the Plan E levee alignment loops about 3.2 miles around a 600-acre wetland and related undeveloped area just south of Cross Gates Subdivision rather than going straight across this area with a 1-mile section of levee. Looping around this area adds approximately $900,000 to the overall cost of Plan E. However, because this area is currently undeveloped, the arbitary severence of this 600-acre tract would probably require in-kind mitigation.

150. Plan E was selected over Plan J because Plan E is the NED plan and provides more than 260 percent greater excess benefits, Plan E provides both Pearl River and hurricane flood protection, and Plan E causes no measurable increases in river stages. It should also be noted that the costs for Plan J include a new bridge at US 90 that could be used to mitigate for the river stage increases caused by this plan. LDOT estimates a new 1,000-foot bridge being considered at US 90 would cost approximately $3.0 to $4.0 million and would reduce the backwater effects of the US 90 embankment by 0.5 to 0.6 foot.

151. Consideration was given to providing Standard Project Flood (SPF) protection, which would be greater than the NED (200-year) level of protection, to reduce the potential risks associated with levee overtopping or failure. However, the 200-year levee design with 3 feet of freeboard would not be overtopped by the SPF. Also, based on existing forecasting techniques, an advanced warning time of 1 to 2 days for major storm events occurring in the lower Pearl River Basin is considered adequate warning time for residents to engage in floodfighting activities and, if necessary, evacuate the flood plain. For example, the 2-8 April 1983 storm event which produced record flood stages in the Slidell area was centered over Columbia, Mississippi, which is approximately 120 miles upstream of Slidell. On 9 April 1983, more than 2 days after the majority of rain had fallen, the Pearl River crested with a record stage of 21.2 feet, NGVD, at the Pearl River gage which is located some 8 miles upstream of the Slidell area.

152. As a result of the advance warning time, many Slidell residents were able to conduct sandbagging and other floodfighting activities reducing the number of homes actually flooded. During this flood, the Vicksburg District provided over 319,000 sandbags to the St. Tammany Parish Police Jury to help in these floodfighting activities.

153. Based on the protection that would be provided by the 200-year levee design with freeboard and the existing forecasting and floodfighting techniques, it does not appear that providing greater than the NED (200-year) level of flood protection is warranted in the Slidell area.

154. Local interests have also expressed their preference for the 200-year design over the SPF design because the real estate requirements are less.

MITIGATION REQUIREMENTS

155. Throughout this study, close coordination has been maintained with the U. S. Fish and Wildlife Service (FWS). FWS stated in the FWS Coordination Act Report (Appendix G) that the recommended plan can be implemented without any significant impacts on fish and wildlife resources, and no mitigation will be required.

DESCRIPTION OF RECOMMENDED PLAN

156. The recommended plan, as shown on Plate J-22, consists of Plan A to protect the Slidell area north of I-10 and Plan E to protect the Slidell area south of I-10. As shown on Plate J-23, these levee plans would provide protection from the April 1983 flood of record. Pertinent data regarding the major features of Plans A and E are presented in Table 11.

Real Estate Requirements

157. Assuming offsite borrow is used for levee construction, perpetual easements will be required for approximately 59 acres for Plan A and 113 acres for Plan E. Fee title will be required on 2 acres for Plan A (area required for pump station) and 4 acres for Plan E (area required for 2 pump stations).

158. Real estate cost estimates are based on recent aerial photographs and field investigations and include contingencies and relocation assistance. Appendix E (Tables E-16 and E-18) contains a more detailed estimate of real estate costs for the recommended plan.

Relocation

159. Relocations required as a result of Plans A and E were based on estimated cost plus 25 percent contingencies to relocate or replace an existing

TABLE 11
RECOMMENDED PLAN
PERTINENT DATA
OFFSITE BORROW
SLIDELL, LOUISIANA

Item	Plan A	Plan E
Levees		
Length (miles)	4.5	10.5
Maximum height (feet)	16	16
Average height (feet)	5.8	5.8
Average base width (feet) [a/]	58	58
Embankment (cubic yards)	313,800	656,100
Pumping Stations		
Location	Gum Bayou	Doubloon Bayou (main)
Design capacity (cubic feet per second)	50	250
Drainage area (acres)	3,770	6,500
100-year sump elevation (feet)	8.7	6.9
Required sump area (acres)	485	1,200
Location		Cross Gates
Design capacity (cubic feet per second)		15
Drainage area (acres)		360
100-year sump elevation (feet)		9.0
Required sump area (acres)		89
Floodgates		
Major		
Location	Gum Bayou	Doubloon Bayou (main)
Size (feet)	10 x 8	Double 7 x 8
Type	Box	Box
Location		Cross Gates
Size (feet)		5 x 5
Type		Box

TABLE 11 (Cont)

Item	Plan A	Plan E
Floodgates (Cont)		
Minor		
Number	3	3
Size (inches)	36	42
Number	2	1
Size (inches)	42	48
Number	1	2
Size (inches)	48	Double 54
Number	2	
Size (inches)	60	
Rights-of-way Requirements (acres)		
Levees (perpetual easements)	59	113
Pumping plant and major floodgates (fee title)	2	4
Total	61	117

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[a] To determine average rights-of-way width for levees, a minimum of 40 feet must be added to the average base width of levee.

facility along the proposed levee alignments. Items that would require relocation include roads, powerlines, telephone cables, waterlines, sewerlines, gaslines, etc. In addition, there are four cemeteries located in the vicinity of the proposed levee alignment for Plan E. Based on the relocation surveys, it appears that Plan E could be constructed without requiring cemetery relocations. When the exact levee alignments are established during detailed engineering and design studies, every attempt will be made to avoid impacting these cemeteries. The cost of relocations was not of great significance when compared to the cost of the entire project. The detailed relocation costs associated with the recommended plan are shown in Appendix E, Tables E-16 and E-18.

Levees and Floodwalls

160. The recommended levee plan for the Slidell area (Plans A and E) is depicted on Plate J-22. These levee alignments indicate the possible line of protection that would be afforded an area. In some reaches of proposed levee alignment, natural ground may be sufficient to preclude levee construction. However, access would be necessary during floodfighting activities. The exact location of the levee is determined from detailed engineering and design studies and coordination with the local sponsor. The detailed engineering and design studies basically begin once the feasibility report has been approved. Levees to protect the area vary in height from 0 to 16 feet for both Plans A and E. The right-of-way for levees would be cleared and material for levee embankment would be hauled in from commercial borrow pits. A detailed estimate of costs associated with levee construction for the tentatively selected plan is contained in Appendix E, Tables E-16 and E-18.

161. The need for floodwalls must be evaluated on a case-by-case basis and a final determination would be made during detailed engineering and design studies. As previously stated, in order for a floodwall to be justified, it must be less costly to construct than relocation of the structure. If locals desire a floodwall in a given location that varies from the above policy, then the local sponsor would be responsible for the difference in the cost of the levee and the floodwall. Depending on the location, floodwalls may also require 3 feet of freeboard to adequately protect the area and also to protect the floodwall from possible overtopping and undermining of the structure.

Floodgates

162. Plan A includes a 10- by 8-foot concrete box culvert located on Gum Bayou. This floodgate would serve in conjunction with a pumping station. Plan A would also include eight smaller floodgates or minor structures to remove interior drainage. The various sizes of these floodgates are shown in Table 11.

163. Plan E includes two major structures, a double 7- by 8-foot concrete box culvert located on Doubloon Bayou (main sump) and a 5- by 5-foot concrete box culvert located below Cross Gates Subdivision (Cross Gates sump). Each of these floodgates would operate in conjunction with a pumping station. Plan E also includes six minor floodgates. The various sizes of these drainage structures are shown in Table 11.

164. All major and minor floodgates would be equipped with slide gates which would be closed when river stages on the West Pearl River are higher than the interior ponding stages. These drainage structures would be constructed to allow the maximum amount of water to flow when the slide gates are open. These structures would remain open most of the year which will allow the normal exchange of water to take place.

165. The approximate locations of major and minor floodgates are shown on Plate J-22. The location of these structures could change as a result of more detailed surveys.

Pumping Plants or Sump Areas

166. The pumping plants utilized in these studies generally consist of three pumps that total the design capacity and would be phased in as needed. Electric pumps were used because cost data for this type prime mover were available. Selection of pumps and prime movers for the approved plans will be accomplished during the advanced engineering and design analysis. The pumps would be operated only when the river stages on the West Pearl River are higher than the interior ponding elevations. The start and stop pump elevation data for the recommended plan are shown in Table 12. Additional operational data regarding the pumps are discussed in Appendix C. The cost of pumping plants for the recommended plan is contained in Appendix E, Tables E-16 and E-18. Boat-launching ramps landside of the levee at Gum and Doubloon Bayous are included in the cost for pumping plant facilities. These ramps are necessary to provide access for general maintenance of these channels, sump areas, and pump facilities. These ramps will also provide access needed for the State of Louisiana, Department of Wildlife and Fisheries, to continue regular chemical spraying for controlling the growth of water hyacinths in these bayous.

TABLE 12
START AND STOP PUMP ELEVATION DATA
RECOMMENDED PLAN
SLIDELL, LOUISIANA

Plan	Elevation (Feet, NGVD)	
	Start Pump	Stop Pump
A	3.6	3.0
E		
(Main Sump)	2.6	1.0
(Cross Gates Sump)	3.6	2.4

167. Sump areas are required for the pumping plant to operate effectively and would have to be zoned by the local sponsor for nondevelopment. The required sump acreage for the recommended plan is shown in Table 11 and depicted on

Plate J-22. These areas are based on the 100-year sump elevations as shown in Table 11.

Construction

168. For the purpose of the economic analysis, levee construction in the Slidell area is estimated to begin in late 1988 or early 1989 and take approximately 2 to 3 years to complete. Levees, pumping plants, floodgates, and other minor structures will be constructed using standard construction techniques.

169. The levee would be constructed using suitable offsite borrow hauled in from commercial borrow pits. The quantity of borrow material required for levee construction was increased by 25 percent to account for overbuild due to settlement. As previously discussed, cost estimates comparing the cost of on- to offsite borrow were made. In all cases, offsite borrow was found to be the least costly alternative because of the high land values in the project area.

COST ESTIMATE

170. The cost estimates for levee construction are based on limited field surveys and 2-foot contour mapping. Unit costs of all features were based on prevailing costs and knowledge of the similar construction activities in the area. Detailed cost estimate for the recommended plan is presented in Appendix E, Tables E-16 and E-18. The first cost of the recommended plan is based on October 1985 price levels and summarized in Table 13. Under traditional cost-sharing requirements, the local sponsor will be responsible for providing land, easement, rights-of-way, and relocations necessary to construct this project and operation and maintenance of the project after construction. These requirements are discussed in more detail in this report under the sections "Division of Plan Responsibilities" and "Recommendation."

TABLE 13
FIRST COSTS OF RECOMMENDED PLAN
SLIDELL AREA, LOUISIANA
($000)

Account No./Item		Plan A	Plan E	Total
01	Lands and Damages	1,695	2,260	3,955
02	Relocations	70	247	317
11	Levees	3,634	6,514	10,148
13	Pumping Plants	597	2,199	2,796
30	Engineering and Design	680	1,420	2,100
31	Supervision and Administration	440	916	1,356
	Total	7,116	13,556	20,672

OPERATION AND MAINTENANCE

171. The local sponsor will be responsible for all costs associated with the operation and maintenance of this project after construction including major replacement costs. Estimated operation and maintenance costs are summarized in Table 14. Major replacement costs for pumps were assumed to occur in year 51 of the project life and were annualized over this period.

LOCAL SPONSOR

172. The local sponsor for this project is the St. Tammany Parish Gravity Drainage District No. 3. Their letter to the Vicksburg District Engineer expressing their willingness to fulfill the items of local cooperation required for the recommended plan is contained in Attachment 3.

DIVISION OF PLAN RESPONSIBILITY

173. The purpose of this section is to present pertinent information concerning the Federal and non-Federal responsibilities regarding cost apportionment and the division of responsibilities for construction and subsequent operation and maintenance of the recommended project. Such cost apportionment is based on Federal legislative and Administrative policies.

174. Section 3 of the Flood Control Act of 1936 establishes certain local cost-sharing requirements for Federal flood control projects. Local interests are required to provide all lands, easements, rights-of-way, and all alterations and relocations to utilities, streets, bridges, buildings, storm drains, and other structures and improvements; hold and save the United States free from damages due to the construction works; and operate and maintain the project after completion. In addition to the above requirements, each pump station will require a certain size sump area to operate effectively. Therefore, Corps policy requires that prior to construction all sump areas would either have to be legally zoned or acquired by the local sponsor to prevent structural development from occurring these areas. For the purpose of this study, zoning is considered the preferred method of restricting development within the sump areas. Zoning is preferred by the local sponsor and individual landowners because it allows landowners to retain sump areas for private recreational use. Also, many landowners have private residences located adjacent to sump area lands and are concerned that if these lands are acquired through fee title or easement they would be open to public access. During detailed engineering and design studies coordination will continue with the local sponsor and landowners regarding the option of zoning and/or acquiring sump area lands. However, it should be noted that all lands required for the pump stations and drainage structures would be acquired in fee title, whereas the levee rights-of-way would be acquired in easement.

175. The traditional Federal and non-Federal cost-sharing requirements for construction of the recommended plan is summarized in Table 15.

176. Under the traditional cost-sharing arrangement, the Federal Government is responsible for 100 percent of all construction costs associated with a flood control project. In addition, the Federal Government would design and prepare detailed plans and specifications and construct the project.

TABLE 14
ANNUAL OPERATION AND MAINTENANCE COSTS
RECOMMENDED PLAN
SLIDELL, LOUISIANA

Plan	Level of Protection	Pump Size	Pump				Levees and Floodgates b/	Total
			Electrical Cost	Operation Cost	Maintenance Cost a/	Total		
	(year)	(cfs)	($)	($)	($)	($)	($)	($)
A	200	50	11,800	7,800	11,100	30,700	20,500	51,200
E	200	250 and 15	45,200	15,400	18,000	78,600	23,800	102,400
Total			57,000	23,200	29,100	109,300	44,300	153,600

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a/ Includes major replacement costs for pumps.

b/ Major replacement costs for minor floodgates are based on using concrete pressure pipe.

TABLE 15
TRADITIONAL COST-SHARING REQUIREMENTS
RECOMMENDED PLAN
SLIDELL, LOUISIANA
($000)

Account No./Item		Plan A			Plan E			Total		
		Federal	Non-Federal	Total	Federal	Non-Federal	Total	Federal	Non-Federal	Total
01	Lands and Damages	0	1,695	1,695	0	2,260	2,260	0	3,955	3,955
02	Relocations	0	70	70	0	247	247	0	317	317
11	Levees	3,634	0	3,634	6,514	0	6,514	10,148	0	10,148
13	Pumping Plants	597	0	597	2,199	0	2,199	2,796	0	2,796
30	Engineering and Design	680	0	680	1,420	0	1,420	2,100	0	2,100
31	Supervision and Administration	440	0	440	916	0	916	1,356	0	1,356
Total		5,351	1,765	7,116	11,049	2,507	13,556	16,400	4,272	20,672

177. As previously discussed, the local sponsor would also be responsible for lands and damages, relocations, and all operation and maintenance costs. An estimate of the annual operation and maintenance costs associated with the recommended plan is shown in Table 14.

178. Congress authorized the recommended plan with passage of the FY 85 Supplemental Appropriations Act (Public Law 99-88), pending a binding cost-sharing arrangement acceptable to the Secretary of the Army, or under terms and provided for in subsequent legislation when enacted into law. The proposed cost-sharing requirements for the recommended plan as authorized by Public Law 99-88 are contained in Senate Bill 1567. Under this bill, if lands, easements, rights-of-way, and relocations (LERR) exceed 20 percent of the total project costs, the non-Federal entity must provide all LERR plus a 5 percent cash contribution. If LERR are less than 20 percent of the total project cost, the non-Federal entity must provide LERR plus a cash contribution such that the total non-Federal contribution equals 25 percent of the total project cost. Based on October 1985 price levels, the LERR for the recommended plan equal 21 percent of the total project costs.

179. The Federal and non-Federal cost-sharing requirements for construction of the recommended plan assuming Senate Bill 1567 is enacted are summarized in Table 16.

TABLE 16
SENATE BILL 1567 PROPOSED COST-SHARING REQUIREMENTS
RECOMMENDED PLAN
SLIDELL, LOUISIANA
($000)

Item	Amount
	($)
Federal	15,366,000
Non-Federal	5,306,000
LERR a/	4,272,000
5 Percent Cash Contribution	1,034,000
Total	20,672,000

a/ Lands, easements, rights-of-way, and relocations.

PUBLIC VIEWS AND COORDINATION

180. Close coordination has been maintained with local residents, police jurors, and several Federal and state agencies since the April 1983 flood. Coordination with many local residents and local government officials started during the floodfight. This contact provided insight into what the locals perceived as the needs of the area. They provided several levee plans that have been evaluated to provide protection from the flooding problems in the area.

181. It was recognized from the beginning of this study that any plan developed by the Corps would be contingent upon the measures installed by LDOT at the highway crossings of I-10 and US 90-190. LDOT, working with FHWA, initiated a study of the I-10 embankment with USGS following the 1980 flood to determine what measures are needed to alleviate the overtopping of the I-10 embankment. Results of this study indicate that a new 1,000-foot bridge span appears to be the best solution for solving this problem. Present studies are being conducted by USGS to determine what mitigation measures are needed at US 90-190; however, target backwater reductions for US 90-190 were provided to the Vicksburg District by LDOT (see Attachment 1).

182. Numerous informal meetings were held with FWS during the course of this study to transfer information and discuss alternatives. This close coordination resulted in the development of a recommended plan that is environmentally acceptable and can be implemented without any significant impacts to the fish and wildlife resource.

183. A public meeting was held on 27 June 1984 in Slidell to present the Corps preliminary findings for local consideration and receive comments from the local people. The meeting was attended by approximately 500 persons with the vast majority supporting flood control. The Vicksburg District presented seven preliminary levee alignments that had been evaluated, of which only three were economically feasible. A representative of LDOT presented their findings to date. Following the presentation, considerable discussion centered around the adequacy of openings in I-10 and US 90 and location of levee alignments and borrow areas. Local residents expressed concern that onsite borrow areas would require too much of the remaining vacant land along each levee alignment and could pose a safety hazard because of their location adjacent to residential subdivisions.

184. A workshop was held in Pearlington, Mississippi, on 25 July 1984 to discuss the flooding problems in that area. The meeting was attended by approximately 50 residents of Pearlington who experienced the April 1983 flood. It was determined that only 14 structures had actually been flooded. The Pearlington residents had two major concerns--that levees in Slidell would increase flood stages in Pearlington and that several of the local roads needed to be raised to provide Pearlington with adequate evacuation routes when flooding occurs on the East Pearl River. They expressed little desire

for levees or any other flood protection measures for structures in the area. It was explained at this meeting that studies by the Vicksburg District show that levees in Slidell will have no measurable effect on river stages at Pearlington because very little storage would be removed from the very wide flood plain in this area. Also, the Corps would be unable to assist in the raising of state and county roads in Pearlington since the Corps has no authority for this type of work.

185. The locals in Slidell have expressed a real desire for flood control. Recent discussions with representatives of the St. Tammany Parish Police Jury and local residents about the level of protection needed for each area show them in support of a 200-year protection plan. Providing less than 200-year protection would not be acceptable.

186. The draft feasibility report for Slidell, Louisiana, and Pearlington, Mississippi, was disseminated on 18 March 1985 to various state and Federal agencies and local interests for review and comment. The draft report also included the draft Environmental Impact Statement, the Section 404(b)(1) Evaluation, and the Coastal Zone Management Consistency Determination and as such, this coordination has complied with the requirements of the National Environmental Policy Act of 1969, the Clean Water Act of 1977, and the Coastal Zone Management Act of 1972. The tentatively selected plan (i.e., recommended plan) presented in this report consists of a 15-mile levee system (Plans A and E) to provide 200-year flood protection to the Slidell area north and south of I-10. No plans were found to be economically feasible for the Pearlington, Mississippi, area. Comments received on the draft report are addressed in the EIS and Appendix I.

187. A final public meeting was held on 17 April 1985 in Slidell, Louisiana, to present the recommended plan to the public. Prior to this meeting, an information summary and public meeting notice were distributed to approximately 1,100 people, and coverage was provided by the news media. Approximately 300 people attended this meeting. Comments were received from almost 200 individuals. Of those responding, near unanimous support was received for the levee plan north of I-10 (Plan A), but many requests were made to the Vicksburg District to evaluate another levee plan south of I-10 (referred to as Plan J). This evaluation is included in the final report. Opposition to the proposed levee plans was voiced by several residents of Pearlington, Mississippi, and Slidell, Louisiana, because of concern that levees in Slidell would raise river stages on the Pearl River. However, studies by the Vicksburg District show that levee Plans A and E (i.e., recommended plan) would not measurably increase flood stages on the Pearl River.

188. Throughout the course of this study, homeowners in the River Oaks and Indian Village Subdivisions have indicated by letters, telephone calls, and meetings that they do not desire protection.

189. Locals have requested that they be involved in the determination of final levee alignments and in locating the floodwalls.

CONCLUSIONS

190. The Slidell area has major flooding problems with existing annual flood damages exceeding $1.6 million. The majority of these flood damages occur to residential developments.

191. The studies described in this report have been extensive and thorough. All reasonable alternative solutions to the problems and needs have been evaluated in determining the recommended plan.

192. No plans were found implementable for the Pearlington, Mississippi, area. Levees and nonstructural measures were evaluated for Pearlington; however, none of these flood damage reduction alternatives were economically feasible.

193. Since the April 1985 public meeting, another levee plan, referred to as Plan J, has been evaluated for the Slidell area south of I-10. The results of this analysis indicate that although Plan J was economically feasible, Plan E (the recommended plan) was still the NED plan or the plan that provided the greatest excess benefits. Plan E was selected over Plan J because it provides substantially more excess benefits, provides protection from both hurricane and Pearl River flooding, and causes no measurable increase in Pearl River flood stages.

194. The recommended plan for Slidell is the NED plan. As shown on Plate J-22, this plan consists of a 4.5-mile levee system providing 200-year protection to the subdivisions north of I-10 (Plan A) and a 10.5-mile levee system providing 200-year river and hurricane protection to many of the subdivisions south of I-10 (Plan E). The first cost of these two levee systems is approximately $20.7 million and the systems will protect some 3,029 existing structures against the 1983 flood of record. This 15.0-mile levee project would be environmentally acceptable and has an overall benefit-cost ratio of 1.6.

RECOMMENDATIONS

195. I recommend that improvements for flood control (Plans A and E), along the West Pearl River in St. Tammany Parish (Slidell), Louisiana, authorized in conformance with Public Law 99-88, be implemented as a Federal project, with such modifications thereto as in the discretion of the Chief of Engineers may be advisable and in accordance with cost-sharing and financing arrangements which are satisfactory to the President and Congress. I also recommend that no further studies be conducted for Pearlington, Mississippi, at this time.

196. The total first cost of the recommended project, based on October 1985 price levels, is $20,672,000. Operation, maintenance, and replacement costs are estimated at $153,600 annually. This recommendation is made with the provision that, prior to implementation, non-Federal interests will agree to comply with the following requirements:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for the project, including borrow, ponding, and disposal areas necessary for implementation and later maintenance of the project.

b. Hold and save the United States free from damages due to implementation and later maintenance of the project, not including damage due to the fault or negligence of the United States or its contractors.

c. Maintain and operate all works after completion, including a flood warning system and any major replacement of pumps and related facilities, in accordance with regulations prescribed by the Secretary of the Army.

d. Accomplish without cost to the United States, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements necessary for the project excluding railroad bridges and approaches and facilities necessary for the normal interception of disposal of local interior drainage at the line of protection.

e. Prescribe and enforce regulations or other management techniques to prevent encroachment on flood plain areas, channels, rights-of-way, and levees, along with interior drainage, ponding, and sump areas, necessary for proper functioning of the project; and if interior drainage, ponding, or sump areas are impaired, provide promptly and without cost to the United States substitute storage or equivalent pumping capacity.

f. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

197. Recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

Pat M. Stevens IV
Colonel, Corps of Engineers
District Engineer

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

ATTACHMENT 1
MAIN REPORT

LETTER FROM LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT REGARDING PLANNED MITIGATION MEASURES AT I-10 AND US 90-190

Department of Transportation and Development

P. O. BOX 94245
BATON ROUGE, LA. 70804-9245

Robert G. Graves
Secretary

Edwin W. Edwards
Governor
(504)324-7606

June 21, 1985

Colonel Dennis J. York
District Engineer
U.S. Army Engineer District, Vicksburg
Post Office Box 60
Vicksburg, Mississippi 39180-0060

Dear Sir:

During previous meetings with your staff, I have stated for their information that:

1. Our planned mitigation measures at I-10 (addition of 1000' bridge) would reduce backwater by approximately 0.8' at River Gardens subdivision and by approximately 1.2' at the roadway, based upon the 1980 flood.

2. While our studies were not yet complete on potential mitigations at Hwys. 90 - 190, our target backwater reduction will be approximately half the 1.2' backwater shown by the model near the intersection of Hwy. 90 and Hwy. 190.

By this means, I wish to formally document the above information. While final results of the mitigation study for the lower highway system are still pending, we are confident that mitigations can be selected which will have the previously estimated effect (0.5' to 0.6' reduction at the highway).

HENRY J. BAROUSSE
HYDRAULICS & STANDARD PLANS ENGINEER

HJB:klc

cc: Mr. Neil Wagoner
Mr. Mitchell Smith
U.S.G.S.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

ATTACHMENT 2
MAIN REPORT

SYSTEM OF ACCOUNTS DISPLAYS

TABLE 1
EFFECTS DISPLAY AND SYSTEM OF ACCOUNTS
FOR LEVEE ALIGNMENT A ABOVE I-10
200-YEAR LEVEL OF PROTECTION
SLIDELL, LOUISIANA

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
1. National Economic Development (NED)			
a. Beneficial Impacts ($000):			
(1) Flood control	$933	0	$933
(2) Intensification	$ 0	0	$ 0
(3) Total beneficial impacts	$933	0	$933
b. Adverse Impacts ($000):			
(1) Value of resources for project construction and operation and maintenance	$ 51	$697	$748
(2) Loss of net income to project lands	$ 0	0	$ 0
(3) Fish and wildlife losses	$ 4	0	$ 4
(4) Total adverse impacts	$ 55	$697	$752
c. Net NED Benefits:	$878	-$697	$181
d. Benefit-Cost Ratio:	--	--	1.2

TABLE 1 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
2. Environmental Quality (EQ)			
a. Environmental Quality Enhanced:			
(1) Land	Provides for a reduction of uncontrolled flooding on 2,863 acres. 2/5/10/	No impact	Provides for a reduction of uncontrolled flooding on 2,863 acres. 2/5/10/
(2) Environmentally related sociocultural elements	Improves living conditions by lessening the dangers, expense, and inconvenience of flooded streets and 2,078 homesites. Reduces damages to public health and safety. Alleviates disruptions to a variety of social and public activities such as public education. 1/6/9/	No impact	Improves living conditions by lessening the dangers, expense, and inconvenience of flooded streets and 2,078 homesites. Reduces damages to public health and safety. Alleviates disruptions to a variety of social and public activities such as public education. 1/6/9/
b. Environmental Quality Degraded:			
(1) Land	Construction will require 61 acres for levee right-of-way. 1/6/9/	No impact	Construction will require 61 acres for levee right-of-way. 1/6/9/

TABLE 1 (Cont.)

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
*(2) Water quality	Minor impacts and water turbidity during construction. After construction, pumps would cause some turbidity but would dissipate quickly. 1/6/9/	No impact	Reduced water quality of area streams.1/6/9/
*(3) Air Quality	Adds to the atmosphere residues from open-air burning, dust, and internal combustion engines. Modifications may remove buffers against winds, summer air temperatures, and evaporation rates. 1/6/9/	No impact	Minor degradation of air quality in area.1/3/6/9/
3. Other Social Effects (OSE)			
a. Beneficial Impacts:			
(1) Population	Insignificant	No impact	Insignificant
*(2) Community growth	Negligible influence upon population but minor influence upon numerous items affecting economic and social conditions for area residents.3/5/10/	No impact	Negligible influence upon population but minor influence upon numerous items affecting economic and social conditions for area residents.3/5/10/

TABLE 1 (Cont.)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
(3) Education, leisure, and cultural opportunities	Enhancement of existing facilities. Indirect effect related to favorable influence upon employment, income, civic pride, etc.3/5/10/	No impact	Enhancement of existing facilities. Indirect effect related to favorable influence upon employment, income, civic pride, etc.3/5/10/
b. Adverse Impacts:			
*(1) Noise	Increased noise levels during construction and during periods of required maintenance.1/6/9/	No impact	Increased noise levels during construction and during periods of required maintenance.1/6/9/
*(2) Esthetic values	Effects during construction result from vegetative clearing debris piling and burning, and aggregation of construction equipment, materials, and activities.1/6/9/	No impact	Degradation of esthetic values in construction area.1/6/9/
*(3) Community cohesion	Possible animosity factor due to easement and fee purchase on some of the 61 acres of project lands required. 1/6/9/	No impact	Possible animosity factor due to easement and fee purchase on some of the 61 acres of project lands required. 1/6/9/
*(4) Displacement of people	No impact	No impact	No impact

TABLE 1 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
4. Regional Economic Development (RED)			
a. Beneficial Impacts:			
*(1) Employment/labor force			
(a) Project construction	Provides 157 skilled, semi-skilled and unskilled jobs, as well as 34 supervisory and administrative jobs for 3 years. 1/6/8/9/	Decreases 157 skilled, semi-skilled and unskilled jobs, and 34 supervisory and administrative jobs for 3 years.1/6/8/9/	No impact
(b) Project operation and maintenance	Negligible	Negligible	Negligible
*(2) Property values	Increased production and value. Conversion to higher value uses. Beneficial effects on housing and other improvements through increased income.3/6/9/	No impact	Increased production and value. Conversion to higher value uses. Beneficial effects on housing and other improvements through increased income.3/6/9/
*(3) Tax revenues	Greater business output providing greater business incomes resulting in increased revenues.3/4/9/	No impact	Greater business output providing greater business incomes resulting in increased revenues.3/4/9/
*(4) Business and industry activity	Slight stimulant to minor impairment during construction. 3/5/9/	No impact	Slight stimulant to minor impairment during construction. 3/5/9/

TABLE 1 (Cont)

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
*(5) Public facilities	Long-term benefits due to increased tax base and improved access.3/6/10/	No impact	Long-term benefits due to increased tax base and improved access.3/6/10/
*(6) Public services	Long-term benefits due to increased tax base and improved access.3/6/10/	No impact	Long-term benefits due to increased tax base and improved access.3/6/10/
(7) Income ($000)	$878 1/3/6/9/	-$697 1/3/6/9/	$181 1/3/6/9/
b. Adverse Impacts:			
*(1) Displacement of farms	Minor effect relative to easement and fee purchases.1/6/9/	No impact	Minor effect relative to easement and fee purchases.1/6/9/
*(2) Public facilities	Minor effect relative to relocations of $70,000 of facilities during construction. 1/6/9/	No impact	Minor effect relative to relocations of $70,000 of facilities during construction. 1/6/9/

TABLE 1 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
*(3) Public services	Minor effect relative to relocations during construction. 1/6/9/	No impact	Minor effect relative to relocations during construction. 1/6/9/

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* Items specifically required in Section 122 and ER 1105-2-240.

Timing:

1/ Impact is expected to occur prior to or during implementation of the plan.
2/ Impact is expected within 15 years following plan implementation.
3/ Impact is expected in a longer time frame (15 or more years following implementation).

Uncertainty:

4/ The uncertainty associated with the impact is 50 percent or more.
5/ The uncertainty is between 10 percent and 50 percent.
6/ The uncertainty is less than 10 percent.

Exclusivity:

7/ Overlapping entry; fully monetized in NED account.
8/ Overlapping entry; not fully monetized in NED account.

Actuality:

9/ Impact will occur with implementation.
10/ Impact will occur when specific additional actions are carried out during implementation.
11/ Impact will not occur because necessary additional actions are lacking.

TABLE 2
EFFECTS DISPLAY AND SYSTEM OF ACCOUNTS FOR LEVEE ALIGNMENT E BELOW I-10
200-YEAR LEVEL OF PROTECTION
SLIDELL, LOUISIANA

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
1. National Economic Development (NED)			
a. Beneficial Impacts ($000):			
(1) Flood control	$2,547	0	$2,547
(2) Intensification	$ 0	0	$ 0
(3) Total beneficial impacts	$2,547	0	$2,547
b. Adverse Impacts ($000):			
(1) Value of resources for project construction and operation and maintenance	102	$1,342	$1,444
(2) Loss of net income to project lands	$ 0	0	$ 0
(3) Fish and wildlife losses	$ 0	0	$ 0
(4) Total adverse impacts	$ 102	$1,342	$1,444
c. Net NED Benefits:	$2,445	-$1,342	$1,103
d. Benefit-Cost Ratio:	--	--	1.8

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
2. Environmental Quality (EQ)			
a. Environmental Quality Enhanced:			
(1) Land	Provides for a reduction of uncontrolled flooding of 6,310 acres. 2/5/10/	No impact	Provides for a reduction of uncontrolled flooding of 6,310 acres. 2/5/10/
(2) Environmentally related sociocultural elements	Improves living conditions by lessening the dangers, expense, and inconvenience of flooded streets and 5,394 homesites. Reduces damages to public health and safety. Alleviates disruptions to a variety of social and public activities such as public education. 1/6/9/	No impact	Improves living conditions by lessening the dangers, expense, and inconvenience of flooded streets and 5,394 homesites. Reduces damages to public health and safety. Alleviates disruptions to a variety of social and public activities such as public education. 1/6/9/
b. Environmental Quality Degraded:			
(1) Land	Construction will require 117 acres for levee right-of-way. 1/6/9/	No impact	Construction will require 117 acres for levee right-of-way. 1/6/9/

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
*(2) Water quality	Minor impacts and water turbidity during construction. After construction, pumps would cause some turbidity but would dissipate quickly. 1/6/9/	No impact	Reduced water quality of area streams.1/6/9/
*(3) Air Quality	Adds to the atmosphere residues from open-air burning, dust, and internal combustion engines. Modifications may remove buffers against winds, summer air temperatures, and evaporation rates. 1/6/9/	No impact	Minor degradation of air quality in area.1/3/6/9/
3. Other Social Effects (OSE)			
a. Beneficial Impacts:			
(1) Population	Insignificant	No impact	Insignificant
*(2) Community growth	Negligible influence upon population but minor influence upon numerous items affecting economic and social conditions for area residents.3/5/10/	No impact	Negligible influence upon population but minor influence upon numerous items affecting economic and social conditions for area residents.3/5/10/

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
(3) Education, leisure, and cultural opportunities	Enhancement of existing facilities. Indirect effect related to favorable influence upon employment, income, civic pride, etc.3/5/10/	No impact	Enhancement of existing facilities. Indirect effect related to favorable influence upon employment, income, civic pride, etc.3/5/10/
b. Adverse Impacts:			
*(1) Noise	Increased noise levels during construction and during periods of required maintenance.1/6/9/	No impact	Increased noise levels during construction and during periods of required maintenance.1/6/9/
*(2) Esthetic values	Effects during construction result from vegetative clearing, debris piling and burning, and aggregation of construction equipment, materials, and activities.1/6/9/	No impact	Degradation of esthetic values in construction area.1/6/9/
*(3) Community cohesion	Animosity factor due to easement and fee purchase requirements. 1/6/9/	No impact	Animosity factor due to easement and fee purchase requirements. 1/6/9/
*(4) Displacement of people	No impact	No impact	No impact

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
4. Regional Economic Development (RED)			
a. Beneficial Impacts:			
*(1) Employment/labor force			
(a) Project construction	Provides 258 skilled, semi-skilled and unskilled jobs, and 47 supervisory and administrative jobs for 3 years.1/6/8/9/	Decreases 258 skilled, semi-skilled and unskilled jobs, and 47 supervisory and administrative jobs for 3 years.1/6/8/9/	No impact
(b) Project operation and maintenance	Negligible	Negligible	Negligible
*(2) Property values	Increased production and value. Conversion to higher value uses. Beneficial effects on housing and other improvements through increased income.3/6/9/	No impact	Increased production and value. Conversion to higher value uses. Beneficial effects on housing and other improvements through increased income.3/6/9/
*(3) Tax revenues	Greater business output providing greater business incomes resulting in increased revenues.3/4/9/	No impact	Greater business output providing greater business incomes resulting in increased revenues.3/4/9/
*(4) Business and industry activity	Slight stimulant to minor impairment during construction. 3/5/9/	No impact	Slight stimulant to minor impairment during construction. 3/5/9/

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net)
	Project Area	Rest of Nation	National Impact
*(5) Public facilities	Long-term benefits due to increased tax base and improved access.3/6/10/	No impact	Long-term benefits due to increased tax base and improved access.3/6/10/
*(6) Public services	Long-term benefits due to increased tax base and improved access.3/6/10/	No impact	Long-term benefits due to increased tax base and improved access.3/6/10/
(7) Income ($000)	$2,445 1/3/6/9/	-$1,342 1/3/6/9/	$1,103 1/3/6/9/
b. Adverse Impacts:			
*(1) Displacement of farms	Minor effect relative to easement and fee purchases.1/6/9/	No impact	Minor effect relative to easement and fee purchases.1/6/9/
*(2) Public facilities	Minor effect relative to relocations of $247,000 of facilities during construction. 1/6/9/	No impact	Minor effect relative to relocations of $247,000 of facilities during construction. 1/6/9/

TABLE 2 (Cont)

Account/Parameter	Location of Impacts		Total (Net) National Impact
	Project Area	Rest of Nation	
*(3) Public services	Minor effect relative to relocations during construction. 1/6/9/	No impact	Minor effect relative to relocations during construction. 1/6/9/

* Items specifically required in Section 122 and ER 1105-2-240.

Timing:
1/ Impact is expected to occur prior to or during implementation of the plan.
2/ Impact is expected within 15 years following plan implementation.
3/ Impact is expected in a longer time frame (15 or more years following implementation).

Uncertainty:
4/ The uncertainty associated with the impact is 50 percent or more.
5/ The uncertainty is between 10 percent and 50 percent.
6/ The uncertainty is less than 10 percent.

Exclusivity:
7/ Overlapping entry; fully monetized in NED account.
8/ Overlapping entry; not fully monetized in NED account.

Actuality:
9/ Impact will occur with implementation.
10/ Impact will occur when specific additional actions are carried out during implementation.
11/ Impact will not occur because necessary additional actions are lacking.

TABLE 3
SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS
200-YEAR LEVEL OF PROTECTION
SLIDELL, LOUISIANA
AREA ABOVE I-10

Item	Conditions/Objectives	Plan A	No-Action Plan
1. Plan Description	A major flood hazard exists in the project area. Approximately 465 homes within the protected area are subject to flooding from the 100-year flood. Flooding causes approximately $804,000 damages annually to structures and related improvements.	This plan calls for a 200-year level of protection levee and a 50-cfs pump at the confluence of Gum Bayou and Pearl River.	The no-action plan must consider as acceptable all damages which occur in the absence of a project and must also consider that present trends of development could continue. Urban growth will continue in the flood plain, increasing flooding problems.
2. Impact Assessment			
a. National Economic Development (NED)	Reduction of the flood hazard in the project area.	$933,000 average annual benefits will be provided through the reduction of flooding to homes, businesses, streets, public facilities, etc.	No protection provided.
b. Environmental Quality (EQ)	Preservation, protection, and enhancement of area's natural resources.	Plan would have minor adverse effect on natural resources. Urban growth would continue to the maximum extent possible.	With no action taken, urban growth will continue to the maximum extent possible.

TABLE 3 (Cont)

Item	Conditions/Objectives	Plan A	No-Action Plan
c. Other Social Effects (OSE)	Improvements in community cohesion by reduction of threat of flooding (security of life, health, and safety), reduction in flood damages, and increased income for area residents.	Plan would strengthen community cohesion over the longrun due to the security and development potential provided by the project.	The community cohesion will weaken due to the uncertainty and threat of flooding.
d. Regional Economic Development (RED)	Improvements in regional growth and development with improvements in income, employment, etc.	Property values throughout the area will increase due to the flood protection provided. Increased business output and business-related activities will generate additional tax revenues.	Urban flooding and damages will continue to occur.
3. Plan Evaluation			
a. Net Impact a/			
(1) NED Excess Benefit over Costs		$181,000	N/A
(2) EQ		Minor adverse impact on some natural resources.	N/A

TABLE 3 (Cont)

Item	Conditions/Objectives	Plan A	No-Action Plan
(3) OSE		Provides reduction in flood damages. Income of area residents will increase.	Potential flooding remains and the uncertainty will have an effect on community cohesion.
(4) RED		Increased business output and other business-related activities will generate additional income and earnings within the project area.	N/A
b. Plan Evaluation			
(1) Acceptability		Plan acceptable to environmentalists and local public.	Unacceptable to all but preservationalists.
(2) Completeness		Plan affords 200-year level of protection and has support of local public.	N/A
(3) Effectiveness		Achieves most NED objectives, but not EQ objectives.	Could achieve some EQ objectives.
(4) Efficiency		A feasible plan to achieve the NED objectives.	N/A
(5) Certainty		Most NED objectives addressed by this plan would be attained.	No certainty that flooding would be reduced.

TABLE 3 (Cont)

Item	Conditions/Objectives	Plan A	No-Action Plan
(6) Geographic Scope		Encompasses the total economic base area where development exists or can reasonably be expected to exist.	Same as NED plan.
(7) NED Benefit-Cost Ratio		1.2	N/A
(8) Reversibility		Possible, but highly improbable.	N/A
(9) Stability		Stable.	Remaining flood hazard would reduce the range of alternative features and create pressure that would make conditions unstable.
c. Ranking of Plan Contribution b/			
(1) NED		1	2
(2) EQ		2	1
(3) OSE		1	2
(4) RED		1	2
(5) Total		5	7

TABLE 3 (Cont)

Item	Conditions/Objectives	Plan A	No-Action Plan
4. Implementation Responsibility		The Federal Government would have the responsibility for a share of the cost of construction. Local sponsor would be responsible for operation and maintenance for the project.	N/A

---

a/ Measured from without condition.
b/ Ranking is from 1 to 2 with 1 being the best.

TABLE 4
SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS
200-YEAR LEVEL OF PROTECTION
SLIDELL, LOUISIANA
AREA BELOW I-10

Item	Conditions/Objectives	Plan E	No-Action Plan
1. Plan Description	A major flood hazard exists in the project area. Approximately 1,339 homes within the project area are subject to flooding from the 100-year flood. Flooding causes approximately $2.25 million damages annually to structures and related improvements.	This plan calls for a 200-year level of protection levee, a 250-cfs pump on Doubloon Bayou, and a 15-cfs pump below Cross Gates Subdivision.	The no-action plan must consider as acceptable all damages which occur in the absence of a project and must also consider that present trends of development could continue. Urban growth will continue in the flood plain, increasing flooding problems.
2. Impact Assessment			
a. National Economic Development (NED)	Reduction of the flood hazard in the project area.	$2.55 million average annual benefits will be provided through the reduction of flooding to homes, businesses, streets, public facilities, and reduction of psychological effects of flooding.	No protection provided.
b. Environmental Quality (EQ)	Preservation, protection, and enhancement of area's natural resources.	Plan would have minor adverse effect on natural resources. Urban growth would continue to the maximum extent possible.	With no action taken, urban growth will continue to the maximum extent possible.

TABLE 4 (Cont)

Item	Conditions/Objectives	Plan E	No-Action Plan
c. Other Social Effects (OSE)	Improvements in community cohesion by reduction of threat of flooding (security of life, health, and safety), reduction in flood damages, and increased income for area residents.	Plan would strengthen community cohesion over the longrun due to the security and development potential provided by the project.	The community cohesion will weaken due to the uncertainty and threat of flooding.
d. Regional Economic Development (RED)	Improvements in regional growth and development with improvements in income, employment, etc.	Property values throughout the area will increase due to the flood protection provided. Increased business output and business-related activities will generate additional tax revenues.	Urban flooding and damages will continue to occur.
3. Plan Evaluation			
a. Net Impact a/			
(1) NED Excess Benefit over Costs		$1,103,000	N/A
(2) EQ		Adverse impact on some natural resources.	N/A

TABLE 4 (Cont)

Item	Conditions/Objectives	Plan E	No-Action Plan
(3) OSE		Provides reduction in flood damages. Income of area residents will increase.	Potential flooding remains and the uncertainty will have an effect on community cohesion.
(4) RED		Increased business output and other business-related activities will generate additional income and earnings within the project area.	N/A
b. Plan Evaluation			
(1) Acceptability		Plan acceptable to environmentalists and certain segments of the local public.	Unacceptable to all but preservationalists.
(2) Completeness		Plan affords 200-year level of protection, both river and hurricanes, and has support of some local public.	N/A
(3) Effectiveness		Achieves most NED objectives, but no EQ objectives.	Could achieve some EQ objectives.
(4) Efficiency		A feasible plan to achieve the NED objectives.	N/A
(5) Certainty		Most NED objectives addressed by this plan would be attained.	No certainty that flooding would be reduced.

TABLE 4 (Cont)

Item	Conditions/Objectives	Plan E	No-Action Plan
(6) Geographic Scope		Encompasses the total economic base area where development exists or can reasonably be expected to exist.	Same as NED plan.
(7) NED Benefit-Cost Ratio		1.8	N/A
(8) Reversibility		Possible, but highly improbable.	N/A
(9) Stability		Stable.	Remaining flood hazard would reduce the range of alternative features and create pressure that would make conditions unstable.
c. Ranking of Plan Contribution b/			
(1) NED		1	2
(2) EQ		2	1
(3) OSE		1	2
(4) RED		1	2
(5) Total		5	7

TABLE 4 (Cont)

Item	Conditions/Objectives	Plan E	No-Action Plan
4. Implementation Responsibility		The Federal Government would have the responsibility for a share of the cost of construction. Local sponsor would be responsible for operation and maintenance for the project.	N/A

---

a/ Measured from without condition.
b/ Ranking is from 1 to 2 with 1 being the best.

ATTACHMENT 3
MAIN REPORT

LETTER OF INTENT FROM LOCAL SPONSOR

GRAVITY DRAINAGE DISTRICT NO. 3
OF THE PARISH OF ST. TAMMANY
P.O. BOX 1234
SLIDELL, LA. 70459

July 22, 1985

Colonel Dennis York
District Engineer
U.S. Army Corps of Engineers
Vicksburg District
P.O. Box 60
Vicksburg, Mississippi 39180-0060

Colonel York:

On behalf of the Board of Commissioners of Gravity Drainage District No. 3 of the Parish of St. Tammany, please be advised of the intent of this agency to serve as local sponsor for the tentatively selected lower Pearl River Basin Flood Protection Plan.

The District realizes the responsibilities that are incumbent to the local sponsor such as acquisition of lands, easements and rights-of-way, as well as operation and maintenance of the project after its completion by the Corps. of Engineers.

In issuance of this letter, Gravity Drainage District No. 3 of the Parish of St. Tammany understands that the Corps of Engineers will finalize its Draft Report on the lower Pearl River Basin Flood Protection Plan and identify the exact local cost to the District prior to a request for the District to execute a formal committment.

Gravity Drainage District No. 3 of the Parish of St. Tammany expects the U.S. Army Corps of Engineers to utilize the District as the lead agency in coordinating all meetings with other affected agencies in the release of information pertaining to the lower Pearl River Basin Flood Protection Plan.

The Board of Commissioners looks forward to a continued excellent working relationship with you and your staff in our joint effort to reduce the impact of flooding in the lower Pearl River Basin.

Sincerely,

Michael D. Bentson

Michael D. Bentson
Vice-President

MDB/lmm

FINAL ENVIRONMENTAL IMPACT STATEMENT

FINAL
PEARL RIVER BASIN
ENVIRONMENTAL IMPACT STATEMENT
SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

The responsible lead agency is the U. S. Army Engineer District, Vicksburg.

Abstract: The study area comprises approximately 65,000 acres and includes parts of St. Tammany Parish, Louisiana, and Hancock County, Mississippi. In the recent past, accelerated urban expansion in the Slidell, Louisiana, and Pearlington, Mississippi, areas has taken place adjacent to or within the Pearl River flood plain. This encroachment and urbanization have resulted in recurring economic losses from natural flooding events. The area naturally supports one of the few remaining large contiguous bottom-land hardwood, wooded swamp, and marsh complexes. Nine alternatives were initially selected for detailed study and included the 100-year, 200-year, and SPF designs for three different levee alignments. In response to public input during the formal review process, an additional levee alignment, Alternative J, was investigated. Alignment A protects residential areas north of I-10, and Alignments D, E, and J protect areas south of I-10. Plan A (200-year design) provided the greatest net economic benefits of the alternatives studied to protect areas north of I-10 (the National Economic Development (NED) plan). Of the alternatives investigated to provide protection south of I-10, Plan E (200-year design) is the NED plan. The recommended alternative is a combination of Plans A and E (200-year design). The Plans D and J alternatives were the least favorable because of adverse environmental and cultural impacts. The recommended plan was selected based on public concerns, its minimal environmental impacts, and its positive contribution to economic development. The recommended alternative will protect 9,173 acres and cost $20,672,000. Excess annual benefits over cost and the benefit-cost ratio are estimated to be $1,284,000 and 1.6, respectively.

For additional information on the EIS, please contact:

Commander
U. S. Army Engineer District, Vicksburg
ATTN: LMKPD-Q (Ms. Maryetta Smith)
Post Office Box 60
Vicksburg, Mississippi 39180-0060

Telephone: (FTS 542-5433)
(Commercial (601) 634-5433)

NOTE: Information, displays, maps, etc., discussed in the Main Report are incorporated by reference in the EIS.

FINAL
PEARL RIVER BASIN
ENVIRONMENTAL IMPACT STATEMENT
SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

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FINAL
PEARL RIVER BASIN
ENVIRONMENTAL IMPACT STATEMENT
SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

1. SUMMARY

1.01. Major Conclusions and Findings.

a. Major flooding of urbanized areas located along the West Pearl River in Slidell, Louisiana, was experienced in 1979, 1980, and 1983. Pearlington, Mississippi, which is located on the East Pearl River, is more susceptible to flooding from hurricanes than headwater flooding from the East Pearl River. During the planning process, various alternatives were developed to provide headwater flood protection for urban areas and reduce the risks to human welfare. Alternatives were evaluated to determine the plan that best meets planning objectives for economic and environmental considerations. The process of plan formulation and selection is fully discussed in the section of the Main Report entitled "Formulation of Preliminary Plans, Analysis of Plans Considered in the Final Array, and Comparison of Detailed Plans," pages 20-59.

b. The objectives of National Economic Development (NED) are to increase the value of the nation's output of goods and services and improve national economic efficiency consistent with protecting the nation's environment. The plan that maximizes excess benefits over costs is designated as the NED plan. For the Slidell-Pearlington study area, the combination of two alternatives in the Slidell area--one located north of I-10 (Plan A, 200-year design) and one located south of I-10 (Plan E, 200-year design) best met NED objectives and were designated the NED alternative for this study.

c. Recommended Plan (Plans A and E, 200-Year Design, Plate J-21). The major features of the recommended plan are a combination of the 200-year design for Plans A and E to provide protection for a total area of 9,173 acres which extends from north of I-10 to south of US 190. The system would include 15.0 miles of levee; 3 major floodgates equipped with 15-, 50-, and 250-cfs pumping plants; a total of 1,774 acres of sump storage area; and 14 minor slide gate structures. This plan would provide annual benefits of $3,480,000 and excess benefits over cost of $1,284,000 at the interest rate of 8-5/8 percent. Total first cost, based on October 1985 price levels, is estimated at $20,672,000. The recommended plan is divided into two areas, one north of I-10 and one south of I-10.

(1) The plan will protect 2,863 acres north of I-10 and includes 4.5 miles of levee, one major floodgate, 485 acres of sump storage area adjacent to the 50-cfs pumping station, and 8 minor slide gate structures. For the area north of I-10, annual benefits and excess benefits over cost calculated at the current interest rate of 8-5/8 percent are $933,000 and $181,000, respectively. Total first cost is estimated at $7,116,000.

(2) The plan will protect 6,310 acres south of I-10 and includes 10.5 miles of levee; two major floodgates equipped with pumping plants; an 89-acre sump storage area adjacent to the 15-cfs pumping plant south of the Cross Gates Subdivision; a 1,200-acre sump storage area adjacent to the 250-cfs pumping plant on Doubloon Bayou; and six minor slide gate structures. Annual benefits are $2,547,000 with excess benefits over cost of $1,103,000. Total first cost is estimated at $13,556,000.

The NED plan is the recommended plan for the Slidell area. The recommended plan consists of Plans A and E to protect the areas north and south of I-10. Both of these plans provide 200-year protection which approximates the April 1983 flood of record and could be implemented without any significant impacts on fish and wildlife resources (see pages 42-45 and 47 of the main report).

d. Section 404(b)(1) Evaluation. Based on the guidelines established by the Environmental Protection Agency (40 CFR 230), an evaluation pursuant to Section 404 of the Clean Water Act has been completed (Appendix H). The proposed discharges and fill actions are specified as complying with the requirements of the guidelines. The proposed action would not induce urban development within jurisdictional wetlands inside the protected area. Zoning of approximately 816 acres of wetland (includes 48 acres of open water area) within the project-related sump storage areas would prohibit further development within these low-lying flood-prone areas.

e. Flood Plain Management.

(1) Executive Order 11988 concerns flood plain management and directs all Federal agencies to assert leadership to reduce flood losses; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial functions served by flood plains.

(2) Protecting the project area from flooding will have an adverse impact on the natural environment. Plans A, D, and E presented in this report will not adversely impact the natural storage benefits of the flood plain during floods of great magnitude. However, Plan J as proposed by local interests would result in the loss of Fritchie Marsh as a headwater flood storage area (approximately 6,400 acres). The plans will not induce development other than the conversion of some forests, wooded swamps, and grassland to open levee rights-of-way and sump storage areas. Based on Federal

Emergency Management Agency (FEMA) maps, approximately 5 percent of the 100-year flood plain could be enclosed within the levees with the recommended plan.

(3) Flood protection for the study area should not induce further structural development within the existing flood plain. Although some additional residential development and possibly some industrial development may occur in the future, there are adequate alternative sites for development outside the flood plain area. The project benefits did not include any benefits for induced residential or industrial development.

(4) During the study, several means of minimizing adverse impacts were developed and coordinated with various fish and wildlife agencies. Nonstructural alternatives, and various structural alternatives were considered during plan formulation. There is no alternative for location of project works outside the flood plain.

f. Wetlands.

(1) Executive Order 11990 for the Protection of Wetlands, issued 24 May 1977, states that Federal agencies shall avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands. It further states that each agency shall avoid undertaking new construction in wetlands, unless the director of the agency finds there is no practicable alternative to such construction and that the proposed action includes all practicable measures to minimize harm to wetlands.

(2) With implementation of the recommended plan, 29 acres of wetlands will be converted to open grassed levee rights-of-way. A total of 816 acres of wetlands (includes 48 acres of open water), 638 acres of forest land, and 320 acres of grassland will be designated as sump storage areas prohibiting any further structural development within these areas. The wetlands in the sump area may experience some indirect effects related to urbanization of surrounding areas and the reduction of recharge from the 100-year or greater flood events. However, all impacts have been considered and the positive impact of prohibiting further development in the sump storage area far outweigh the adverse impacts related to actual levee construction in wetland areas. Preliminary levee corridors were sited where possible to avoid wetlands in order to minimize wetland losses.

g. Threatened and Endangered Species. No Federally recognized critical habitat of endangered or threatened species has been designated in the project area. The Vicksburg District informed the U. S. Fish and Wildlife Service (FWS) Endangered Species Office of the occurrence of an active bald eagle nesting location and supporting habitat in the White Kitchen's area. FWS has indicated that the recommended flood control plan as currently sited would not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat of such species (see Appendix F, Attachment 1).

h. Historic, Archeological, and Cultural Resources. In accordance with the National Historic Preservation Act of 1966 (Public Law 89-665), National Environmental Policy Act of 1969 (Public Law 91-190), and Protection and Enhancement of the Cultural Environment (Executive Order 11593), a cultural resources survey of the project area was undertaken by the Vicksburg District in addition to literature and record review. Approximately 6 prehistoric and 17 historic remains locations were recorded or found in the general vicinity. Currently, no sites within the surveyed area are listed on the National Register of Historic Places and no sites have been determined eligible. However, testing and analysis of sites indicate that five of the sites could be potentially eligible for listing on the National Register (see Table F-2, Appendix F). Six cemeteries and three possible gravesites were recorded during the survey. Cemeteries are not considered eligible for the National Register, but are protected by other state statutes. Proposed levee locations could possibly impact four cemeteries and two possible historic graves.

i. Coastal Zone Management. In accordance with Public Law 92-583, 16 U.S.C. 1451, et seq., Coastal Zone Management Act of 1972, and in accordance to the Guidelines established by the State of Louisiana, Coastal Resource Management Act of 1978, a Coastal Zone Management Program Consistency Determination has been completed (Attachment 2, Appendix F). The proposed action is in compliance with the above guidelines.

1.02. Areas of Controversy and Unresolved Issues.

a. The degree of protection needed, actual levee locations, borrow requirements, modification of the base flood plain, change of hydrologic regimes, related wetland impacts, and cultural impacts were major areas of concern during plan selection.

b. Extensive study and evaluation were required to select tentative levee and pumping plant sizes for various levels of protection. Several levee alignment modifications were investigated to minimize wetland impacts. Borrow materials will be acquired offsite from upland sources to reduce project costs and minimize project rights-of-way land use requirements and related environmental impacts.

c. Another major area of controversy centered around I-10 and US 90-190 modifications. Model studies conducted by the Louisiana Department of Transportation and Development (LDOT), in cooperation with the U. S. Geological Survey (USGS) and the Federal Highway Administration (FHWA), revealed the need for an additional bridge opening for I-10 which crosses the flood plain, and clearing around existing I-10 bridges and relief openings. Studies are ongoing for US 90-190 crossings within the flood plain (see pages 2, 20, 33, and 34 of the Main Report).

d. All alternatives studied will modify the hydrologic regimes and the base flood plain. Floodgate structures will be closed and pumping initiated only when river stages are abnormally high. Base flood plain modification resulting from the recommended plan would reduce the flood storage area by only 5 percent.

e. Various prehistoric and historic cemeteries and historic gravesites could be impacted by the proposed action. Actual levee rights-of-way once determined in an advanced engineering and design phase will be sited to avoid these resources where possible. If avoidance is not possible, appropriate mitigation will be required (relocation and recovery).

1.03. Relationship to Environmental Protection Statutes and Other Environmental Requirements. During the assessment of the alternatives presented in this document, environmental requirements such as laws, executive orders, and other related statutes and policies were addressed (Table EIS-1).

2. NEED FOR AND OBJECTIVES OF ACTION

2.01. Study Authority. The Slidell, Louisiana, and Pearlington, Mississippi, flood control study is being conducted as an interim study of the Pearl River Basin. It was authorized by eight Congressional resolutions including two for which studies were already funded. These resolutions are listed below.

Date	Resolution	Committee
1 Apr 63	Town Creek at Jackson, Mississippi	Senate Public Works
27 Jun 67	Town Creek at Jackson, Mississippi, downstream to Byram	Senate Public Works
12 Mar 74	Pearl River Basin, Mississippi and Louisiana	Senate Public Works
1 Feb 79	Richland Creek, Richland, Mississippi	Senate Environment and Public Works
9 May 79	Pearl River Basin, Mississippi and Louisiana	Senate Environment and Public Works
9 May 79	Richland, Mississippi	House Public Works and Transportation
9 May 79	Pearl River Basin, Mississippi and Louisiana	House Public Works and Transportation
9 May 79	Pearl River, Mississippi	House Public Works and Transportation

TABLE EIS-1
RELATIONSHIP OF PLANS TO ENVIRONMENTAL REQUIREMENTS
PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS
RECOMMENDED PLAN: COMBINATION OF PLANS A AND E (200-YEAR DESIGN)

Environmental Requirement	Alternative Plans Evaluated in Detail				
	Levee Options				
	Recommended Plan	Plan A	Plan D	Plan E	Plan J
Federal Statutes					
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et seq.	Partial a/	Partial a/	Partial a/	Partial a/	Partial a/
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	Full	Full	Full	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	Partial c/	Partial c/	Noncompliance b/	Partial c/	Noncompliance b/
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	Full	Full	Noncompliance b/	Full	Noncompliance b/
Endangered Species Act, as amended, 16 U.S.C., 1531 et seq.	Full	Full	Full	Full	Partial
Estuary Protection Act, 16 U.S.C. 1221, et seq.	Full	Full	Full	Full	Full
Farmland Protection Policy Act, 7 U.S.C. 4201, Public Law 97-98	Full	Full	Full	Full	Full
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq.	N/A	N/A	N/A	N/A	N/A
Fish and Wildlife Coordination Act, as amended, U.S.C. 661, et seq.	Full	Full	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601, et seq.	N/A	N/A	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 U.S.C. 1401, et seq.	N/A	N/A	N/A	N/A	N/A
National Historic Preservation Act, as amended, 16 U.S.C. 470a, et seq.	Partial a/	Partial a/	Partial a/	Partial a/	Partial a/
National Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq.	Partial c/	Partial c/	Partial c/	Partial c/	Partial c/
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	N/A	N/A	N/A	N/A	N/A
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	N/A	N/A	N/A	N/A	N/A
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A	N/A	N/A	N/A	N/A
Executive Orders, Memoranda, Etc.					
Floodplain Management (E.O. 11988)	Partial c/	Partial c/	Noncompliance	Partial c/	Noncompliance
Protection of Wetlands (E.O. 11990)	Partial c/	Partial c/	Noncompliance	Partial c/	Noncompliance
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A	N/A	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 August 1976)	Full	Full	Full	Full	Full
President's Water Policy Initiatives (13 June 1978)	Full	Full	Full	Full	Full

TABLE EIS-1 (Cont)

Environmental Requirement	Alternative Plans Evaluated in Detail				
		Levee Options			
	Recommended Plan	Plan A	Plan D	Plan E	Plan J
State and Local Policies					
Louisiana Natural and Scenic Rivers System	Full	Full	Full	Full	Full
Louisiana Water Quality Standards (Certification)	Partial c/	Partial c/	Noncompliance b/	Partial c/	Noncompliance b/
Land Use Plans					
(None)					
Required Federal Entitlements					
(None)					

NOTES: The compliance categories used in this table were assigned based on the following definitions:
Full compliance - all requirements of the Statute, EO, or other policy and related regulations have been met.
Partial compliance- some requirements of the Statute, EO, or other policy and related regulations have been met.
Noncompliance - none of the requirements of the Statute, EO, or other policy and related regulations have been met.
Not applicable - N/A Statute, EO, or other policy not applicable.

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a/ More detailed cultural resources investigations will be conducted as needed prior to construction.
b/ At this point, noncompliance is indicated for Plans D and J because a Section 404(b)(1) Evaluation and a Coastal Zone Management Consistency Determination were not conducted.
c/ Compliance with requirements will be satisfied upon completion of review and signing of the Record of Decision.

2.02. Public Concerns.

a. Major headwater floods in the Slidell area along the West Pearl River were experienced in 1979, 1980, and 1983. Significant damages occurred to residences, commercial properties, roads, bridges, and utilities. The 1983 flood was approximately a 200-year event with damages estimated at more than $5,000,000. In addition to actual property damage, these flood events have had a demoralizing effect. Any significant rise on the Pearl River results in anxiety and trauma for the local residents. Flooding poses the threat of loss of life and forces residents to seek temporary housing outside the overflow area.

b. The study area is also subject to hurricane surges, high tides, wave action, and high winds. Pearlington experienced some damages, primarily because of 6- to 9-foot tides from Hurricane Camille in 1969. Hurricanes have caused no real problem in the Slidell area in recent years. Although major hurricanes are relatively rare events, none of our coastal areas are immune. According to the National Weather Service (NOAA, 1979) on an average, six Atlantic hurricanes occur per year. However, there are significant deviations from this average. Flooding from hurricane surges is generally limited to the area south of Doubloon Bayou.

c. Urban encroachment in recent years has reduced forested wetland and related flood storage within the area. In the Plan A area located between Military Road and north of I-10, a total of 465 structures are within the 100-year base flood plain. In the Plan E area south of I-10 and east of Military Road and US 190, approximately 1,339 structures are located in the 100-year frequency flood plain. Urban development is also destroying suitable habitat for fish and wildlife. As urban growth continues, fish and wildlife habitat will be further reduced unless preservation measures are undertaken by local interests.

2.03. Planning Objectives. Planning objectives stem from national, state, and local water and related land resource management needs specific to the Slidell and Pearlington area. These objectives have been developed through problem analysis and an intense public involvement program and have provided the basis for formulation of alternatives, impact assessment, evaluation, and selection of a recommended plan. The planning objectives are as follows:

a. Develop a comprehensive flood damage prevention plan that would reduce flood damages by providing a higher level of flood protection and reduce the threat to public health and safety.

b. Relieve human suffering, anxiety, and the interruption to daily activities caused by the flooding.

c. Minimize to the exent possible the decline of fish and wildlife habitat in the area.

3. ALTERNATIVES

a. A broad range of flood damage prevention measures were considered in the screening process. These alternatives were developed and evaluated by an interdisciplinary team of planners representing disciplines such as engineering, hydrology and hydraulics, socioeconomic, and environmental. Each of the alternatives was developed through a multiobjective process to satisfy the specific needs identified in this report.

b. Preliminary alternatives were evaluated with no improvements to the existing highways of I-10 and US 90-190. The affected public provided assistance in identifying a range of alternatives to be evaluated. The alternatives investigated to provide flood protection to the Slidell and Pearlington areas include nonstructural alternatives and structural measures (levees with pump stations).

3.01. Plans Eliminated from Further Study. The following plans were investigated, but were eliminated for various reasons presented in the following discussion and were not included in the final array of alternatives.

a. Nonstructural Alternatives.

(1) All practicable nonstructural measures to reduce flood damages were considered in the screening of alternatives. The alternatives included floodproofing, permanent evacuation of the flood plain, flood forecasting, and warning with temporary evacuation, and flood plain regulation by easement, zoning, building codes, and flood insurance.

(2) Residential, commercial, and public structures in the flood plain are primarily slab-on-grade construction. Raising such structures through normal jacking procedures is impractical; therefore, raising structures in place and relocating structures outside the flood plain were eliminated from further consideration.

(3) The other two items under floodproofing--waterproofing of walls and the construction of walls or levees around structures--were analyzed. The costs of these measures far exceeded the costs of structural alternatives. Therefore, the alternatives were eliminated from further study.

(4) The remaining nonstructural measures were eliminated from further consideration because they were not applicable or had already been accomplished in the area.

b. Structural Alternatives Eliminated. The structural plans evaluated for the Slidell and Pearlington flood control study consisted of ten levee plans with the appropriate appurtenant structures required to remove interior drainage and one channel cleanout plan. The channel cleanout plan and six of the levee plans were eliminated during screening for reasons presented in the following discussions. Plans A, D, E, and J were carried forward and will be discussed in the detailed plan section.

(1) Channel Cleanout. Channel cleanout or dredging on the East and West Pearl Rivers was not a viable solution to the flooding because of the high costs involved. The Corps of Engineers, Mobile District, evaluated this alternative (1981) and found it to be infeasible. It was determined that dredging could possibly reduce stages during minor flood events, but would have no measurable effect on river stages during major floods. In addition, channel modification of the West Pearl River would result in adverse impacts to the natural and scenic nature of the stream (see Appendixes F and H).

(2) Plan B.

(a) Plan B was a ring levee that encircled and protected the area as shown on Plate J-12. It begins in the vicinity of Whiskey Island, running eastward until it intersects the upland ridge area. From this point it follows the upland ridge area until it intersects Gum Bayou, then turns and follows the top bank of Gum Bayou until it intersects the point of beginning.

(b) This plan consists of a levee approximately 8.7 miles long, a pump station to be located in the River Gardens area and 12 minor structures to remove interior drainage. This plan proved not to be economically feasible and was eliminated from further study.

(3) Plan C. Plan C was a levee plan developed to protect the Cross Gates and River Crest Subdivisions of Slidell which are located just south of I-10 and east of Military Road (Plate J-13). This plan was put forth by the Military Road Alliance (MRA). It begins at a point where the upland ridge area intersects I-10, running along the upland ridge in a southerly direction, but turns west in the vicinity of Devil's Elbow and intersects higher ground elevations in the vicinity of Military Road. This plan consists of a 1-mile-long levee and a pump station to remove the interior drainage. This plan was determined not to be economically feasible and was eliminated from further study.

(4) Plan F. This levee, put forth by the MRA, was developed to protect the Cobb-Hammock area of Slidell located just north of the intersection of Military Road and I-59 (Plate J-16). The levee encircled the Cobb-Hammock area and intersected higher elevations along I-59. This plan consisted of a levee approximately 1.3 miles long and one major pump station to remove interior drainage. This levee would have provided protection from the Pearl River flows that flow through Porters River and through the area. This plan was determined not to be economically feasible and was eliminated from further analysis.

(5) Plan G.

(a) This levee plan was developed to provide protection to the town of Pearl River, Louisiana, from backwater of the Pearl River flowing through Gum Creek (Plate J-17). Pearl River, Louisiana, is located in the area north of Slidell and west of I-59. The I-59 bridge embankment and the railroad affect stages on Gum Creek. The MRA requested the evaluation of this levee not only because of flooding experienced in Pearl River, Louisiana, but waters from Gum Creek were reportedly flowing into Gum Bayou and raising river stages in that area. This proved to be unfounded by surveys.

(b) The levee followed an old abandoned railroad from a point on the south side of Pearl River and I-59 in a northerly direction crossing Gum Creek and intersecting higher ground.

(c) This levee would be approximately 1.3 miles long and have one major pump station to remove interior drainage. This plan was determined not to be economically feasible and was eliminated from further analysis.

(6) Plan H.

(a) This levee plan was developed to provide protection to the Slidell area south of I-10 (Plate J-18). This plan was developed by the MRA following the June 1984 public meeting. They considered this plan to be more acceptable than Plan D because it did not include the River Oaks or Indian Village Subdivisions and more acceptable than Plan E because it protected more structures.

(b) The levee begins on the upland ridge area near I-10 and runs south along the upland ridge line. It then turns west just below the Cross Gates Subdivision and follows the old levee in that area until it reaches the vicinity of Military Road where it would stop. This portion of the plan is similar to Plan C. It would then resume at the French Branch bridge on Military Road and parallel French Branch until it intersects Old River Road. The levee would then turn east and parallel Old River Road until it intersects the upland ridge area near the Quail Ridge Subdivision and stops. The levee would then resume south of Quail Ridge and run in a southerly direction, crossing Doubloon Bayou until it intersected higher ground at the intersection of US 90-190.

(c) Plan H was an intermittent levee system that did not include freeboard and by Corps standards, this plan would not provide protection from the major flood events. In addition, this plan would conflict with the highway mitigation measures for US 90-190 being considered by LDOT. For these reasons, this plan was eliminated from further consideration.

(7) Plan I. This levee plan was developed to provide protection to the area north of US 90 in Pearlington (Plate J-19). This levee was to encircle the area north of US 90 and encompass most of the structures except the ones located too close to the East Pearl River or along an inlet off the East Pearl River. It would require several pump stations and many minor structures to be an effective system. The levee would also be required to have additional freeboard above the level normally required because it would be located within the hurricane surge area. The area south of US 90 does not lend itself to any type of levee system because of the many bayous and inlets and their proximity to the structures. This plan was determined not to be economically feasible and was eliminated from further study.

3.02. Plans Considered in Detail. Three of the original levee plans, Plans A, D, and E, were carried into the final array. During the formal review of the draft report, a public interest group (MRA) requested that the Corps investigate an additional alternative, Alternative J. Initial studies indicate Alternative J to be economically justified, so the alternative has been included in the final array of alternatives. Plan A provides protection to the area north of I-10 while Plans D, E, and J provide protection to the area south of I-10. All four levee plans were reevaluated using the target backwater reductions that LDOT expects to achieve on the West Pearl River by providing the additional relief openings at I-10 and US 90-190. Reevaluation with the highway improvements in place was done to provide protection from the 100-year, 200-year, and SPF flood events. The NED plan was determined from this array. Pump stations were also optimized to select the pump or pump combinations that maximized excess benefits over cost. Borrow areas were assumed to be located offsite for all alternatives in the final array. The levee alignment locations as presented in the following discussions are only preliminary indications as to a proposed line of protection. The final location of the levee cannot be determined in this level of study; additional surveys and soil borings are required. After the final surveys, the actual location of the levee will be determined through coordination with the local sponsor. A levee will be constructed only in areas where it is needed. Freeboard is required on all levees and is usually 3 feet in height. However, if the natural ground elevation exceeds the design water surface profile by 1 foot or more, no levee will be required. In this type of situation, access would be necessary only during floodfighting activities. Environmental measures considered during the formulation of the alternatives to reduce fish and wildlife impacts included siting levee rights-of-way in upland and cleared areas where possible; avoidance of marsh areas; minimizing impacts on cypress-tupelo wetlands; and where possible, locating structures so not to impede natural drainage. Additionally, it was proposed that floodgates be allowed to remain open except during flood stages to allow normal water exchange to and from the West Pearl River, and that borrow materials be acquired offsite from existing upland commercial pits.

a. Plan A.

(1) Plan A provides protection to approximately 2,863 acres north of I-10. This area is the most frequently flooded area in the Slidell portion of

the study area. The alignment only indicates a line of protection. It must be reiterated that the alignment as presented on Plate J-11 is a preliminary location for feasibility purposes only. Generally, the levee begins northwest of Whiskey Island and runs east to where the upland ridge area is defined from the actual flood plain. It then turns in a southerly direction and follows the upland ridge area, crossing Gum Bayou and terminating at a point near Crawfords Landing. It is primarily located as close as possible to the upland ridge line. In some isolated cases, residences are located so close to the upland ridge line that it may become necessary to either relocate the structure or build a floodwall in lieu of a levee to provide the protection, whichever is cheaper. In other situations, it may become necessary to place some structures outside the protected area, but in this case every attempt will be made to route the levee or floodwall to encompass as many structures as possible.

(2) The 4.5-mile-long levee in Plan A varies in height from 0 to 14 feet to provide protection from the 100-year flood event and from 0 to 16 feet to provide protection from the SPF event. The eight minor structures to remove interior drainage vary in size from a 36- to a 60-inch pipe. The major structure which would be located in Gum Bayou was evaluated using a floodgate and a 50-cfs pump. The floodgate and pump would require that 485 acres be dedicated for a sump area. This plan provided protection to the following subdivisions: Ravenwood, Morgan Bluff Estates, Magnolia Forest, River View, Timber Lake, Honey Island, Hickory Hills, and River Gardens. Plan A was analyzed to provide three levels of protection--100-year, 200-year, and SPF event. The 200-year level of protection for Plan A was found to be the NED plan for the area north of I-10.

b. Plan D.

(1) Plan D is a comprehensive levee plan that would protect approximately 7,502 acres south of I-10 and east of US 90-190 (Plate J-14). It begins in the vicinity of the upland ridge area and I-10 and runs in a southerly direction following the upland ridge area until it crosses Doubloon Bayou near the River Oaks Subdivision. It then encircles the subdivision following the top bank of the West Pearl River before it turns southwest and intersects with US 190 in the vicinity of Belle Acres. It then turns in a northwestward direction crossing Doubloon Bayou and intersects US 190 approximately 5 miles east of I-10.

(2) This plan consists of a levee approximately 10.1 miles in length, a navigational floodgate, and one major floodgate with related pump stations, and four minor structures. The pump stations are located in the area south of the Cross Gates Subdivision and on Doubloon Bayou. A total of 270 acres would be dedicated as a sump storage area for a 15-cfs pump near Cross Gates, and 1,440 acres would be needed for the 250-cfs pump on Doubloon Bayou. The 4 minor structures on this plan varied from a 42-inch to a double 54-inch pipe. These floodgates would be equipped with slide gates to prevent water

from the Pearl River from backing into the area. The levees for the different levels of protection varied in height from 0 to 14 feet for 100-year flood protection and 0 to 17 feet for SPF protection. The subdivisions protected include Cross Gates, River Crest, Holly Ridge, River Oaks, Indian Village, Belle Acres, Tammany Trailer Park, Beverly Heights, Ozone Air, French Branch Estates, Frenchmen's Estates, Doubloon Bayou Estates, Quail Ridge, The Settlement, Abney Country Aire, Pearl Acres, Pennydale, and Lake Village.

(3) Plan D was analyzed to provide three levels of protection--100-year, 200-year, and SPF events. Local interests at the June 1984 public meeting requested the Corps to investigate the possibility of installing a navigable floodgate on Doubloon Bayou to pass boat traffic from the River Oaks and Indian Village Subdivisions. Locals in these subdivisions were unanimously opposed to the project without this feature. However, interest in protection of these areas has not increased as expected even with this navigable floodgate. This plan was also unacceptable to FWS because of the protection provided undeveloped land in the flood plain.

c. Plan E.

(1) Plan E is designed to protect approximately 6,310 acres of generally developed area, leaving large undeveloped areas outside the levee (Plate J-15). This alignment protects the flood plain from additional encroachment and does not encourage further development. The levee begins in the vicinity of the upland ridge area south of I-10 and proceeds in a southerly direction to a point just south of the Cross Gates Subdivision where the alignment turns west, running until it is in the vicinity of Military Road. It then parallels Military Road until it intersects French Branch and parallels it to the intersection of Old River Road. It then parallels Old River Road east until it intersects the upland ridge line near the banks of the West Pearl River. From that point, it turns in a southerly direction following the upland ridge line until it intersects Doubloon Bayou. After crossing Doubloon Bayou, it continues in a southerly direction until it passes Belle Acres Subdivision. Turning west and crossing US 190, the levee crosses Doubloon Bayou again and finally intersects US 190 approximately 0.5 mile east of I-10.

(2) This 10.5-mile-long levee will have two pump stations and six minor structures to remove interior drainage. This plan protects the same areas as Plan D except for the River Oaks and Indian Village Subdivisions. The plan was analyzed to provide three levels of protection--100-year, 200-year, and SPF events.

(3) This plan required two pump stations to operate effectively, a 15-cfs pump south of the Cross Gates Subdivision, but not in the same location as in Plan D, and a main pump station (250-cfs) located on Doubloon Bayou.

Designated sump storage areas would require 89 acres near Cross Gates and 1,200 acres for the Doubloon Bayou facility. The six minor structures varied in size from 42-inch to a double 54-inch pipe. These minor structures or floodgates would be equipped with slide gates which would be closed during high river stages. The levees varied in height from no levee to approximately 14 feet in isolated locations for 100-year protection and from no levee to approximately 17 feet in isolated cases for SPF protection.

(4) Plan E was also reanalyzed to reflect improved highway conditions. Plan E is more environmentally acceptable and is endorsed by FWS as the best plan for protecting the area south of I-10. The 200-year level of protection for Plan E was also determined to be the NED plan for this alignment.

d. Plan J.

(1) Levee Plan J was proposed by the MRA at the April 1985 public meeting as an alternative to Plan E. A detailed evaluation of this alternative was not included in the March 1985 draft interim report.

(2) Plan J was designed to protect 8,526 acres located south of I-10 (see Plate J-20). The acreage figure does not include the approximate 6,400-acre Fritchie Marsh complex. The plan begins in the vicinity of the upland ridge just south of I-10 and follows the same alignment as Plan E to just south of Belle Acres Subdivision. At that point, the levee parallels US 190 in a southeasterly direction to Apple Pie Ridge where it crosses US 190 and follows Apple Pie Ridge to its junction with US 90.

(3) This 8.4-mile-long levee system includes one 15-cfs pumping station with a major gravity outlet structure south of the Cross Gates Subdivision, one major gravity outlet structure on Doubloon Bayou north of the Indian Village Road, and nine minor drainage structures. Designated sump storage areas would require 89 acres near Cross Gates and 439 acres adjacent to Doubloon Bayou within the protected area. The plan was analyzed to provide three levels of headwater flood protection (100-year, 200-year, and SPF). The subdivisions protected from headwater (river) flooding include Cross Gates, River Crest, Belle Acres, Tammany Trailer Park, Beverly Heights, Ozone Aire, French Branch Estates, Doubloon Bayou Estates, Abney Country Aire, Pearl Acres, Pennydale, Lake Village, Frenchmen's Estates, Quail Ridge, The Settlement, Avery Estates, and the Apple Pie Ridge area. However, many of these subdivisions are subject to hurricane surges. Plan J does not provide for any hurricane surge protection.

e. Recommended Alternative. The recommended plan is a combination of the 200-year level of protection for Plans A and E and is also the NED plan. The major features are the same as previously discussed for the separate plans. The total combined plan will provide flood protection for 9,173 acres which encompass most of the developed lands in the Slidell portion of the study area.

f. Comparative Impacts of Alternatives. Table EIS-2 presents the comparative impacts of the final array of alternatives on significant resources and plan economics. This is a summary of the data developed in technical Appendixes B and F.

4. AFFECTED ENVIRONMENT

4.01. Environmental Conditions.

a. Socioeconomic Conditions. The Slidell-Pearlington area has experienced significant changes in the last two decades. Employment within the area increased approximately 42 percent during the period 1969-1978. Data from the 1980 Census indicate a population of 135,406 in the St. Tammany Parish-Hancock County area, a 67 percent increase over 1970. St. Tammany Parish, classified as a suburb of greater New Orleans, exhibited a stronger rate of growth at 74 percent. Between 1960 and 1980, the city of Slidell experienced a population growth rate of 320 percent. The major source of employment in the study area is government-related, in particular the National Space Test Laboratory (NSTL) facility and the National Aeronautic Space Administration (NASA) computer center. Due to its proximity to New Orleans and according to 1982 figures published by the St. Tammany Parish Department of Development, more than 60 percent of the local work force were commuting out of the parish.

b. Natural Resources.

(1) The physical geography of the Lower Pearl River Basin is typical of many rivers in the southeastern United States. The low stream gradient and broad, flat flood plain produce extensive meanders, natural cutoffs, oxbow lakes, old river runs, bayous, and extensive forested flood plains. The study area is part of an area known as the Coastal Flatwoods. The terrain is basically flat with elevations ranging from 0 to 30 feet, National Geodetic Vertical Datum (NGVD).

TABLE EIS-2
COMPARATIVE IMPACTS OF ALTERNATIVES

1	2	3	4	5	6	7	8	9	10
	Alternative Economics							Estimated Annualized Fish and Wildlife Resource Values	
Base Condition and Alternatives	First Cost ($000)	Annual Costs ($000)	Benefit-Cost Ratio	Socioeconomic Resources	Water Resources (acres)	Fisheries	Wetlands a/ (acres)	Dollars ($000)	AAHUV's
Base Condition	N/A	N/A	N/A	Recurring flood hazard	Available: 5,778	No significant impact	Available: 44,000	Available: 464.12	Available: 3,224 - raccoon 3,906 - grey squirrel 4,883 - barred owl
Plan A									
100-year	6,803	721	1.2	Positive social well-being impact	Impacted: b/ 36 Lost: 0	No significant impact	Impacted: b/ 449 Lost: 21	-3.37	+ 3 raccoon
200-year c/	7,116	752	1.2		Impacted: b/ 36 Lost: 0		Impacted: b/ 449 Lost: 21	-3.39	- 22 grey squirrel
SPF	8,047	844	1.1		Impacted: b/ 36 Lost: 5		Impacted: b/ 449 Lost: 18	-3.52	- 28 barred owl
Plan D									
100-year	23,516	2,680	0.94	Positive social well-being impact	Impacted: b/ 82 Lost: 2	No significant impact	Impacted: b/ 530 Lost: 24	+1.24	+474 raccoon
200-year	24,026	2,729	0.98		Impacted: b/ 82 Lost: 2		Impacted: b/ 530 Lost: 26	-0.63	+ 43 grey squirrel
SPF	25,397	2,864	0.96		Impacted: b/ 82 Lost: 4		Impacted: b/ 530 Lost: 29	-0.76	+201 barred owl

TABLE EIS-2 (Cont)

1	2	3	4	5	6	7	8	9	10
	Alternative Economics							Estimated Annualized Fish and Wildlife Resource Values	
[illegible] and Alternatives	First Cost ($000)	Annual Costs ($000)	Benefit-Cost Ratio	Socioeconomic Resources	Water Resources (acres)	Fisheries	Wetlands a/ (acres)	Dollars ($000)	AAHUV's
[illegible]									
100-year	13,100	1,390	1.8	Positive social well-being impact	Impacted: b/ 12 Lost: 1	No significant impact	Impacted: b/ 319 Lost: 8	+0.65	+406 raccoon
200-year c/	13,556	1,444	1.8		Impacted: b/ 12 Lost: 1		Impacted: b/ 319 Lost: 8	+0.61	- 39 grey squirrel
SPF	14,994	1,571	1.7		Impacted: b/ 12 Lost: 2		Impacted: b/ 319 Lost: 23	+0.36	+116 barred owl
Plan J									
100-year	13,849	1,464	1.3	Positive social well-being impact	Impacted: b/ 78 Lost: 1	No significant impact	Impacted: d/ 6,761 Lost: 48	-3.34	0 raccoon
200-year	14,156	1,494	1.3		Impacted: b/ 78 Lost: 1		Impacted: d/ 6,761 Lost: 50	-3.39	- 34 grey squirrel
SPF	15,075	1,584	1.2		Impacted: b/ 78 Lost: 1		Impacted: d/ 6,761 Lost: 55	-3.47	- 8 barred owl
TOTAL c/	20,672	2,196	1.6	Positive impact	Impacted: b/ 48 Lost: 1	No significant impact	Impacted: b/ 768 Lost: 29	-2.78	+409 raccoon - 61 grey squirrel + 88 barred owl

TABLE EIS-2 (Cont)

1 Base Condition and Alternative	11 Endangered Species	12 100-Year Flood Plain Executive Order 11988 (acres)	13 Natural and Scenic Streams and WMA's	14 Existing Recreation Resources	15 Historic and Cultural Sites
Base Condition	Species: Bald Eagle	45,500	Available: 3 streams 1 WMA	Available: 16	23
Plan A					
100-year	No Impact	Lost: -890	No Impact	No Impact	No Impact
200-year c/		-890			
SPF		-890			
Plan D					
100-year	No Impact	Lost: -1,740	No Impact	No Impact	Impact Potential: 6
200-year		-1,740			6
SPF		-1,740			6
Plan E					
100-year	No Impact	Lost: -1,341	No Impact	No Impact	Impact Potential: 6
200-year c/		-1,341			6
SPF		-1,341			6

TABLE EIS-2 (Cont)

1	11	12	13	14	15
Base Condition and Alternatives	Endangered Species	100-Year Flood Plain Executive Order 11988 (acres)	Natural and Scenic Streams and WMA's	Existing Recreation Resources	Historic and Cultural Sites
Plan 3					
100-year	Impact Potential e/	Adverse Impact	No Impact	No Impact	Impact Potential f/
200-year c/	Impact Potential e/	Adverse Impact	No Impact	No Impact	Impact Potential f/
SPF	Impact Potential e/	Adverse Impact	No Impact	No Impact	Impact Potential f/
TOTAL c/	No Impact	Lost: -2,231	No Impact	No Impact	6

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a/ Excluding water resources (open water).
b/ Includes areas within designated sumps.
c/ Recommended plan.
d/ Includes wetlands within designated sump and the Fritchie Marsh complex.
e/ Within 1-mile radius of nesting location.
f/ Similar to Plan E survey data lacking south of Belle Acres Subdivision.

(2) Drainage is generally poor with large areas subjected to some degree of annual flooding. The intensity of flooding varies from year to year or from one flooding period to another during the same year. Areas south of I-10 are subject to some tidal action and hurricane storm surges. The area's humid subtropical climate produces mild winters and temperate summers with a mean annual temperature of approximately 67 degrees F. Average annual precipitation is 63 inches with July being the wettest month receiving 6.76 inches of rain. Soils in the northern part of the study area are predominantly inceptisols. Between I-10 and US 90, the soils change to histosols or peat and muck. The inceptisols are generally of the poorly drained Bibb and Mantachie Series from the Haplaquepts Groups.

4.02. Significant and Institutional Recognized Resources. Section 122 of the River and Harbor Act of 1970 (Public Law 91-611) identifies specific resources that should be addressed to ensure that all effects are fully considered in preauthorization and post authorization planning. These resources are broadly categorized as social, economic, and environmental. Detailed descriptions of these resources are presented in Appendixes B and F and are summarized in this section. Section 5, Environmental Effects, describes the effects that would occur to resources if the potential actions are implemented.

a. Socioeconomic Resources.

(1) In 1980, the population of the study area was 135,406. Population projections for the Slidell area indicate that the trend of increased population will continue. The population is projected to be 394,348 by the year 2040. Current average population density is about 98.9 persons per square mile. Projections indicate that by the year 2040, density will be 366.8 persons per square mile in St. Tammany Parish.

(2) Employment within the area increased 42 percent during the period 1969-1978. Due to the proximity of greater New Orleans, 1982 data indicate that more than 60 percent of the local work force in St. Tammany Parish commute. Unemployment rates declined by 2 percent in 1978.

(3) Residential use currently accounts for approximately 25 percent of available land in the Slidell portion of the study area. Based on population projections, residential land use will increase by 59 percent by the year 2000. According to 1980 Census data, there were 40,684 housing units in St. Tammany Parish with a median value of an owner-occupied unit being $64,149.

b. Water Resources.

(1) Water resources were declared nationally significant with the enactment of the Clean Water Act, Public Law 92-500, 33 U.S.C. 1251, et seq. (also known as the Federal Water Pollution Control Act). The stated objective of the Act is:

> "To restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

The study area contains 5,778 acres of various water bodies including approximately 38 miles of streams, 12 bayous, and numerous lakes and ponds of varying sizes. In addition to the apparent open water areas, the area contains large tracts of fresh, intermediate and brackish marshes. Scattered throughout the more upland portions of the study area are numerous pitcher plant bogs where the water table is at or near the ground surface elevation. Approximately 70 percent of the study area is classified as being within the 100-year flood plain.

(2) Surface water quality in most streams in the Pearl River Basin is generally suitable for most uses. However, land clearing in the upper Basin and urbanization along various reaches of the Pearl River are adversely impacting the surface water quality. Violations of various water quality criteria have been reported north of the study area below the cities of Jackson, Mississippi, and Bogalusa, Louisiana. The West Pearl River is listed in the Louisiana Natural and Scenic Streams System, which is an indication of high surface water quality.

c. Aquatic and Fishery Resources. The aquatic system within the study area is separated into three ecological types--rivers and streams, lakes, and estuary. This aquatic system supports a diverse fish fauna. There are 133 species of fish known in the Pearl River Basin. The majority of these species are primarily freshwater, but there are 17 species of oceanic or estuarine species that enter the lower Pearl River. Six species of anadramous/catadramous fishes occur in the Pearl, but the extent of usage by these species is not known. Fishing pressure varies, but due to increasing human populations within the study area, demands on the fishery resource are increasing. These resources are of local, regional, and national importance. Two specific Federal laws, Public Law 85-624 (Fish and Wildlife Coordination Act) and Public Law 89-304 (Anadromous Fish Conservation Act) recognizes the significance of these types of resources.

d. Wetland Resources. Wetlands are transition lands between terrestrial and aquatic systems and include a variety of areas. Cypress-tupelo swamps and marshes are immediately recognized as wetlands. Determining the extent of and the upland limits of wetlands is often a difficult task. The Vicksburg District has determined that approximately 68 percent (44,200 acres) of the study area is subject to regulatory action under the Clean Water Act. The approximate extent of wetlands in the study area is depicted on Plate J-24. These areas serve as temporary storage areas for out-of-bank overflow. Other wetland processes include infiltration of water, recharge to ground water, sediment fallout, debris entrapment, and detrital input to the riverine system. Sources of institutional recognition include Executive Order 11990, Protection of Wetlands (May 1977), and Public Law 90-454, The Estuary Protection Act.

e. Terrestrial and Wildlife Resources.

(1) The activities of man have affected flood and soil characteristics within the Pearl River Basin. This in turn has influenced plant distribution and the related wildlife communities. The Pearl River flood plain within the study area consists of highly diverse broadleafed deciduous forest (bottomland hardwoods) interspersed with extensive cypress-tupelo area and in some areas pine islands. This reach of the Pearl River Basin remains in a somewhat natural state due in part to state action. The Louisiana Department of Wildlife and Fisheries (LDWF) began purchase of lands for the Pearl River WMA in 1971. The WMA now totals 32,813 acres.

(2) Except for urbanized (disturbed) areas, the diverse habitats within the study area support numerous wildlife forms. According to LDWF data, game species within the area include deer, turkey, squirrels, rabbits, waterfowl and woodcock. The large contiguous Pearl River WMA provides refuge for numerous other wildlife species. Specific data on wildlife densities within the immediate study area are limited. However, wildlife coordination effects indicate that the area hunter success data generally reflect carrying capacities similar to those presented in LDWF report of 1 December 1969, The Vanishing Delta Hardwoods, Their Wildlife Resource. LDWF estimates indicate that on an average, the Pearl River WMA provides approximately 2.4 man-days per acre of wildlife- and fishery-oriented activities including both consumptive and nonconsumptive uses. It must be emphasized that general wildlife densities are not reflective of those within urbanized areas. Urbanization and other manmade changes alter successional patterns and the corresponding wildlife densities.

f. Endangered and Rare Species. The Endangered Species Act of 1973 (Public Law 93-205, 16 U.S.C. 1531, et seq.) and the Bald Eagle Act, 16 U.S.C. 668, provides for the conservation of endangered and threatened species of fish, wildlife, and plants and for other purposes.

(1) The wooded swamps and marshes in the White Kitchen's area located between US 90 and Doubloon Bayou have supported an active bald eagle nesting site and a large mixed wading bird colony for a number of years.

(2) The white-fringed orchid (Plantanthea blepheriglotlis) was recorded during field studies conducted by the Corps in slash pine-pitcher plant bog areas within the study area. This is the first recorded in the State of Louisiana.

g. Executive Order 11988, "Base Flood Plain." Approximately 70 percent of the study area has been delineated as being within the Federally recognized and mandated 100-year flood plain. Executive Order 11988, Flood Plain Management, signed 24 May 1977, emphasizes and requires Federal agencies to recognize the environmental aspects and values of flood plain management. Additionally, the Order requires agencies to consider the public benefits that would be realized from restoring and preserving flood plains.

h. Pearl River WMA. Approximately 26,200 acres of the 32,813-acre state-owned Pearl River WMA are located within the study area. This large contiguous hardwood-wooded swamp-marsh complex is one of the most heavily utilized areas of the state. Game and fur species are managed for public use including hunting and trapping, and for their esthetic value. Fishery resources are also managed.

i. Natural and Scenic Streams (Louisiana R.S. 56:1841 through 56:1849). The West Pearl River, Morgan River, and Holmes Bayou located within the study area have been listed by the State of Louisiana as natural and scenic. This designation indicates the ecological and esthetic significance of the areas.

j. Recreation Resources. According to the Louisiana State Comprehensive Outdoor Recreation Plan (SCORP) (1977), the study area is part of Subregion 1B of Region 1 which ranks first in the state in population. Approximately 30 percent of the state population is located in this region. Therefore, the demand for outdoor recreation within the study area is increasing. Currently within the general area there are three state parks, eight public boat-launching facilities, two public camping areas, one state-owned WMA, and three streams listed as natural and scenic by the State of Louisiana.

k. Cultural and Historical Resources (Public Law 89-655, 16 U.S.C. 470a, et seq.). Cultural surveys recorded cultural remains at 19 locations within the Slidell portion of the study area--6 prehistoric and 17 historic. No sites within the surveyed areas are listed on the National Register of Historic Places and none have been determined to be eligible.

5. ENVIRONMENTAL EFFECTS

5.01 Socioeconomic Impacts.

a. The primary impact of the various plans is the social well-being of the local residents. Plan A options would protect 1,575 acres of existing urban area from 200-year or greater frequency floods. Plan D options would protect 3,160 acres of existing urban area, but result in the loss of development potential of 1,098 acres. Plan E options would protect 2,925 acres of existing urban land from the 200-year or greater flood, but would result in the direct loss of the development potential of 748 acres. Plan J options would protect 3,861 acres of existing urban area from headwater flooding, but would not provide any degree of protection from hurricane surges.

b. The recommended plan (combination 200-year design, Plans A and E) would provide total annual benefits of $3,480,000 and excess benefits over costs of $1,284,000 at the current interest rate of 8-5/8 percent. Total first cost, based on October 1985 price levels, is estimated at $20,672,000. Approximately 178 acres of land currently in private ownership would be required for levee construction and would be removed from the tax base resulting in the direct loss of related tax revenues. In addition, the 1,774 acres required for sump storage could not be developed. The total annual electrical costs related to pump operation for the tentatively selected alternative would be $57,000. Table 10 in the Main Report presents a comparison of related costs and benefits of the alternatives studied in detail.

5.02. Environmental Resources Impacts.

a. Water Resources. During construction, earthmoving operations would expose soils. Precipitation during the construction period would erode these soils and cause localized increases in turbidity levels in the area streams, in particular Gum Bayou and Doubloon Bayou. The materials used for levee construction would be from an existing upland borrow source and would not contain contaminants. Upon completion of the construction phase, the levees and rights-of-way would be revegetated. Therefore, water quality impacts would be generally localized and short-term in nature and are not considered to be significant (see Appendix H).

b. Aquatic and Fishery Resources.

(1) The recommended alternative and other alternatives studied in detail would result in minimal short-term adverse impacts on existing aquatic resources. The tentatively selected plan would result in the loss of 1 acre of aquatic area with a related annualized dollar loss in fisheries of $34.26. The aquatic area losses resulting from Plan A (100-year, 200-year, and SPF options) are 0, 0, and 5 acres with annualized dollar losses in fisheries of $0, $0, and $171.31, respectively. The 100-year, 200-year, and

SPF options for Plan D would result in the direct loss of 2, 2, and 4 acres of aquatic area. Annualized dollar losses of fisheries are $68.52 for the 100-year and 200-year options and $137.05 for the SPF option. The 100-year, 200-year, and SPF options for Plan E would result in the direct loss of 1 acre of aquatic area for the 100-year and 200-year options and 2 acres for the SPF option. Annualized dollar losses are $34.26 for the 100- and 200-year options and $68.52 for the SPF option.

(2) Construction of the Plan J options would only result in the direct loss of 1 acre of aquatic area, which would reflect an annualized dollar loss of $34.26. However, the long-term secondary impacts related to the severence of exchange between the West Pearl and Fritchie Marsh could adversely affect the aquatic communities within the marsh.

c. Wetlands Resources.

(1) All of the alternatives studied in detail would produce adverse impacts to wooded wetlands (water tupelo-swamp tupelo) and marsh in varying degrees (see Appendix F). The recommended alternative was sited to minimize direct impacts to wetlands by avoiding these areas where possible. Rights-of-way for the tentatively selected plan would result in the direct loss of 29 acres of water tupelo-swamp tupelo, 21 acres north of I-10, and 8 acres south of I-10. However, 816 acres of wetland (includes 48 acres of open water), located within the 1,774-acre designated sump storage area would be protected from future development. Urban encroachment in surrounding areas could shorten the longevity of these areas over the life of the project.

(2) The Plan A options would result in the direct loss of 21 acres of water tupelo-swamp tupelo for the 100- and 200-year design. The SPF option for Plan A would result in the direct loss of 18 acres of water tupelo-swamp tupelo and 5 acres of related open water area. Approximately 485 acres of existing water tupelo-swamp tupelo landside of the Plan A levee would be designated for sump storage, prohibiting any future urban development.

(3) The 100-year, 200-year, and SPF options for Plan D would result in a direct loss of 24, 26, and 29 acres of water tupelo-swamp tupelo, respectively. The alignments for Plan D make no attempt to avoid wetlands, but were designed to shorten linear rights-of-way requirements and protect the largest amount of land area. Approximately 530 acres of water tupelo-swamp tupelo and 125 acres of related open water would be enclosed by the Plan D options.

(4) The Plan E 100- and 200-year options would result in a direct loss of 8 acres and the SPF option would result in a direct loss of 23 acres of water tupelo-swamp tupelo. These options were tentatively sited with input from FWS to avoid large contiguous wetland areas where possible.

(5) The 100-year, 200-year, and SPF options for Plan J would result in the direct loss of 10, 12, and 15 acres of water tupelo-swamp tupelo, respectively. The Plan J options would block the exchange of West Pearl River sheetflow into Fritchie Marsh. The elimination of this nutrient and sediment source, although not immediately discernible, would over time aggravate the marsh loss rate.

d. Terrestrial and Wildlife Impacts. Preliminary environmental evaluations indicated that if borrow materials needed for levee construction were acquired onsite, the project-related terrestrial impacts would be significant and environmentally unacceptable. In light of these facts, the general area was surveyed for existing commercial upland sources. It was determined that within the Slidell vicinity, there are a number of active commercial pits. These areas have been cleared of most vegetation. It is assumed for evaluation purposes that no additional upland area would be cleared and that materials would be acquired by excavation within the existing pits. Therefore, terrestrial impacts would be confined to levee rights-of-way.

(1) Implementation of any of the alternatives will reduce consumptive wildlife use within those areas protected by the various levee alignments. The recommended alternative results in annualized monetary losses of $34 to fishery resources and $21,336 to wildlife resources. However, preservation of sump storage areas would result in an annualized gain of $18,457.

(2) Habitat Evaluation Procedures (FWS, 1980) indicate that the combination of Plans A and E would result in an overall gain of 409 average annual habitat units (AAHU's) for raccoon and 88 AAHU's for barred owl, but would result in the loss of 61 AAHU's for grey squirrel. Total gains over losses for the recommended plan were 436 AAHU's. These data and the man-day (monetary) loss data indicate that these plans would not significantly impact fish and wildlife resources in a way that would require the addition of specific fish and wildlife mitigation (see Appendix G).

(3) Plan A, SPF option, would result in a direct annualized monetary loss of $171 to fishery resources and a loss of $8,356 to wildlife. Annualized monetary gain for the preservation of the sump area is $4,932. Monetary losses for the 100- and 200-year events did not vary significantly from the SPF option (see Appendix F, Table F-7). The combined annualized losses over gains for the 100-year, 200-year, and SPF Plan A options are

$3,373, $3,389, and $3,518, respectively. The Plan A options would result in the loss of 22 AAHU's for grey squirrel, 28 AAHU's for barred owl, but show a gain of 3 AAHU's for raccoon. The total losses over gains for the Plan A options were 47 AAHU's.

(4) The combined annualized losses over gains for the 200-year and SPF Plan D options are $626 and $757, respectively. The 100-year option would result in an overall annualized gain of $1,236. The Plan D options would result in gains of 474 AAHU's for raccoon, 43 AAHU's for grey squirrel, and 201 AAHU's for barred owl. The total gains realized for the Plan D options were 718 AAHU's.

(5) Monetary gains over losses for the 100-year, 200-year, and SPF options of Plan E are $654, $612, and $360, respectively. The Plan E options would result in gains of 406 AAHU's for raccoon and 116 AAHU's for barred owl. Grey squirrel habitat would be diminished by 39 AAHU's. The total gains over losses for Plan E options were 483 AAHU's.

(6) The combined annualized terrestrial monetary losses over gains for the 100-year, 200-year, and SPF options for Plan J are $3,308, $3,354, and $3,436, respectively. Annualized fishery monetary losses for each of the options related to construction were $34. Preservation of the sump storage areas would result in an annualized gain of $3,861. The Plan J options would result in the loss of 34 AAHU's for grey squirrel and 8 AAHU's for barred owl. Total direct habitat losses for Plan J were 42 AAHU's. These habitat losses do not reflect potential habitat losses within the Fritchie Marsh complex.

e. Endangered Species. The alternatives presented in the final array would not significantly impact any threatened or endangered species. However, the lower reach of Plan J is within a 1-mile radius of the known bald eagle nesting site.

f. Executive Order 11988, "Base Flood Plain" Impacts.

(1) Within the study area, the 100-year base flood plain is determined by two major controlling factors, headwater floods and hurricane storm surges. Implementation of any of the alternatives would alter the recognized 100-year base flood plain. Plan A would remove 890 acres of flood storage area, an approximate 2 percent reduction of the 100-year base flood plain within the Slidell-Pearlington study area. Plan D would remove 1,740 acres, an approximate 4 percent reduction. Plan E would remove 1,341 acres, an approximate 3 percent reduction. When considering the size and extent,

4.5-mile-wide flood plain, these reductions would appear to be insignificant. However, considering historical land use trends, it must be noted that without strenuous enforcement and strengthening of existing flood plain ordinances and regulations, the potential exists for further encroachment into and reduction of the base flood plain. Cumulative "piecemeal" reductions could significantly alter the natural flood storage capabilities and other related biological functions of these Federally mandated and nationally recognized significant areas.

(2) Plan J would essentially remove the approximate 6,400-acre Fritchie Marsh complex for Pearl River headwater flood storage. The loss of this flood storage would increase stages by 0.2 to 0.4 foot in unprotected areas during major headwater flooding events. This plan does not modify the hurricane storm surge inland profiles. The plan would modify the 100-year headwater flood profile.

g. Pearl River WMA. Implementation of any of the alternatives would not adversely impact the WMA.

h. Natural and Scenic Stream Impacts. Implementation of any of the alternatives would not adversely impact Morgan River, Holmes Bayou, or the West Pearl River.

i. Recreational Resource Impacts. Implementation of any of the alternatives would not adversely impact existing parks, boat-launching facilities, and camping areas. Construction of major control structures would sever access to landside reaches of Gum Bayou and Doubloon Bayou. Plan D includes a navigational flood control structure on Doubloon Bayou near its confluence with the West Pearl River that would allow for passage of watercraft. Plans A and E include boat-launching facilities (at the Gum Bayou and Doubloon Bayou structures) to provide landside access for general maintenance of pump facilities, sump areas and spraying of water hyacinths by the State of Louisiana, Department of Wildlife and Fisheries. Access to the riverside reach of Gum Bayou would continue to be via the public boat-launching facilities at Crawford Landing. Access to the riverside reach of Doubloon Bayou for Plan E would continue to be via the public facilities at Indian Village.

j. Cultural Resources. The Plans D and E options for levee rights-of-way as tentatively located could impact four cemeteries and two possible historic gravesites. Approximately 80 acres that would be impacted by the Plan A options were not surveyed because the local landowner denied access to the area. No other sites would be impacted by Plan A options unless unrecorded sites were located in the unsurveyed area. The Plan J options would have similar impacts as Plans D and E north of the Belle Acres Subdivision; cultural surveys for those areas located south of Belle Acres has not been completed. Further testing and possible recovery will be required during the next level of study when actual locations of rights-of-way are determined.

6. LIST OF PREPARERS

A list of persons primarily responsible for preparation of this document is presented in Table EIS-3.

7. PUBLIC INVOLVEMENT

Various Federal, state, and local interests have been kept informed during the course of this study. Numerous informal meetings were held during 1983, 1984, and 1985 to gather information and discuss alternatives. In August 1984, a meeting and field trip in conjunction with HEP studies were conducted with FWS and Louisiana Department of Wildlife and Fisheries personnel.

A public meeting was held on 27 June 1984 in Slidell, Louisiana. Another formal public meeting was held on 17 April 1985.

A workshop was conducted with local residents of the Pearlington community on 25 July 1984.

8. REQUIRED COORDINATION

The draft EIS was sent to Federal, state, and local agencies and the public for formal review and comments. A brief discussion of all substantive comments received during the study and on the draft report is presented in subsection 11 in this document. Copies of all the specific comments received during the formal review period and corresponding responses are included in Appendix I, Public Views and Responses.

9. STATEMENT RECIPIENTS

All elements listed below were furnished copies of the draft EIS.

Federal

Thad Cochran, U. S. Senator
J. Bennett Johnston, Jr., U. S. Senator
Russell B. Long, U. S. Senator
John C. Stennis, U. S. Senator
Robert L. Livingston, U. S. Congressman
Trent Lott, U. S. Congressman
Department of the Interior, Office of Environmental Project Review
Federal Emergency Management Agency, Washington, D. C.
U. S. Fish and Wildlife Service, Regional Director, Atlanta, Georgia
U. S. Fish and Wildlife Service, Administrator, Washington, D. C.
U. S. Fish and Wildlife Service, Field Supervisor, Vicksburg, Mississippi

TABLE EIS-3
LIST OF PRIMARY PREPARERS

Person	Expertise	Experience	Role in Preparing EIS
Mr. Jerry Dean	Economist/Regional	6 years, economic studies, Vicksburg District	Socioeconomic effects
Mr. Robert Fitzgerald	Hydraulic engineering	2 years water resource planning; 5 years hydraulics, Vicksburg District	Hydraulic effects
Mr. Michael Harden	Civil Engineering	10 years, water resource planning, Vicksburg District	Co-study manager, formulation of alternatives and needs assessment
Mr. Kent Parrish	Civil Engineering	6 years conservation engineering, USDA, Soil Conservation Service; 2 years, water resources planning, Vicksburg District	Co-study manager, formulation of alternatives and needs assessment
Dr. Richard Price	Limnologist	5 years, USDA research assistant; 5 years, water quality studies, Vicksburg District	Water quality effects
Ms. Maryetta Smith	Biology	1 year, urban studies; 6 years, environmental impact studies, Vicksburg District	EIS coordinator, effects on environmental resources and 404 analysis.

Federal (Cont)

Environmental Protection Agency, Regional Administrator, Region VI
Environmental Protection Agency, Regional Administrator, Region IV
Environmental Protection Agency, Administrator, Washington, D. C.
U. S. Department of Commerce, Joyce M. Wood, Director, Office of Ecology and Conservation
U. S. Department of Commerce, Director, National Oceanic and Atmospheric Administration, National Ocean Survey
U. S. Department of Commerce, Regional Director, National Marine Fisheries Service
U. S. Department of Agriculture, Regional Forester, Forest Service
U. S. Department of Agriculture, State Conservationist, Soil Conservation Service
U. S. Department of Health and Human Services, Washington, D. C.
U. S. Department of Energy, Division of NEPA Affairs, Washington, D. C.
Federal Highway Administration, Division Administrator, Baton Rouge, Louisiana
U. S. Department of Transportation, Commander, Eighth Coast Guard District
U. S. Department of Housing and Urban Development, Regional Administrator, Region VI, Ft. Worth, Texas
U. S. Department of Housing and Urban Development, Region IV, Atlanta, Georgia
U. S. Department of Interior, Geological Survey, Washington, D. C.
U. S. Department of Interior, Geological Survey, Baton Rouge, Louisiana
Advisory Council on Historic Preservation

State

Louisiana Department of Health and Human Resources, Office of Health and Environmental Quality
Louisiana Department of Transportation and Development, Office of Public Works, Assistant Secretary
Office of Intergovernmental Relations, Office of Governor
Louisiana Department of Highways, Public Hearings and Environmental Impact Engineer
Louisiana Department of Agriculture, Commissioner
Louisiana Department of Wildlife and Fisheries, Secretary
Louisiana Department of Wildlife and Fisheries, Coordinator, Ecological Studies Section
Louisiana State Parks and Recreation Commission
Louisiana Office of Environmental Affairs
Louisiana Department of Natural Resources, Coastal Zone Management Section
Louisiana Department of Natural Resources, Office of Forestry

State (Cont)

Louisiana Department of Natural Resources, Office of Conservation
Louisiana Department of Natural Resources, Office of Environmental Affairs, Water Pollution Control Station
Louisiana Department of Culture, Recreation, and Tourism, State Historic Preservation Officer
Louisiana Assistant Attorney General
Louisiana Department of Justice, Environmental Section
Louisiana State Planning Office
Louisiana State University, Associate Director, Sea Grant Program, Center for Wetland Resources
Louisiana State University, Curator for Anthropology, Department of Geography of Environmental Affairs
University of New Orleans, Coordinator, Environmental Impact Section, Department of Environmental Affairs
University of New Orleans, Department of Anthropology and Geography
Mississippi Department of Archives and History
Mississippi Department of Wildlife and Conservation
Mississippi Department of Natural Resources
  Bureau of Geology
  Bureau of Pollution Control
  Bureau of Land and Water Resources
Mississippi Forestry Commission
Mississippi State Highway Department
Coordinator Federal-State Programs

Environmental Interests

Ecology Center of Louisiana, Inc.
Orleans Audubon Society, Southwestern Regional Office, Regional Representative
Delta Chapter Sierra Club, New Orleans
Mississippi Chapter Sierra Club, Jackson, Mississippi
National Wildlife Federation, Washington, D. C.
Environmental Defense Fund

Other Interests

Mr. Oliver A. Houck, Professor of Law, Tulane University
Military Road Alliance, Slidell, Louisiana
Middle South Services, Environmental Affairs, New Orleans, Louisiana

10. FWS COORDINATION

The final Fish and Wildlife Coordination Act Report prepared by FWS is presented in Appendix G. FWS recommended seven proposals to which the following responses are provided:

a. No further consideration be given to Alternatives D and J.

Response. The recommended plan includes Plans A and E.

b. The selected plan be implemented to provide flood protection in the Slidell project area.

Response. The recommended plan which consists of Plans A and E, 200-year design is proposed.

c. Interests in levee rights-of-way and construction sites should be purchased for nonconsumptive recreational use.

Response. Upon completion of construction, levee rights-of-way are the responsibility of the local sponsor.

d. Restrictive use zoning or nondevelopment easements should be implemented by the local sponsor prior to project construction and contain language stringent enough to ensure that flood-prone development does not occur and that undeveloped lands in the sump area are utilized for backwater storage.

Response. Sump areas would be zoned for nondevelopment by the local sponsor prior to construction.

e. More restrictive flood plain zoning should be implemented by the appropriate governmental agency in the Slidell area to discourage additional development in the base flood plain.

Response. Flood plain zoning is the responsibility of FEMA and the St. Tammany Parish Police Jury (reference Local Ordinances No. 791 and 523).

f. State and/or Federal tax incentives should be sought for those people outside the protected area(s) who are willing to provide their own means of floodproofing.

Response. State and Federal tax incentives are not within the Corps mandated jurisdictional authority.

g. The selected plan includes boat-launching ramps and parking facilities on Gum and Doubloon Bayous to replace access severed by the levees.

Response. The recommended plan includes boat-launching ramps on Gum and Doubloon Bayous to provide access for general maintenance of pumping facilities, inlet channels, sump areas, and for LDWF to continue regular chemical spraying for controlling the growth of water hyacinths in these bayous. These ramps may have some incidental recreational use, but will not include designated parking facilities.

11. PUBLIC VIEWS AND RESPONSES

The following discussions briefly describe the substantive issues expressed during the study, at the public meetings and during the formal 45-day NEPA review period, and how they were incorporated into the decision-making process. Copies of all comments and corresponding responses are included in Appendix I.

a. FWS and local citizens expressed concerns following the June 1984 public meeting about the impact of onsite borrow requirements. In response to these concerns, alternative sources of borrow materials were investigated and determined to be the least costly source. The decision to acquire borrow materials from existing upland commercial sources was incorporated into the various plans, resulting in reduced levee rights-of-way realty requirements and related environmental impacts.

b. LDWF expressed concerns related to state designated natural and scenic streams, in particular, Morgan River, and boat access in Gum Bayou. The proposed levee system was sited along uplands as much as possible and would not impact Morgan River. Boat-launching ramps were included in the recommended plan at both the Gum Bayou and Doubloon Bayou structures to provide access for general maintenance of pump facilities, inlet channels, sump areas, and for LDWF to continue regular chemical spraying for controlling the growth of water hyacinths in these bayous.

c. At the public meetings in Slidell, Louisiana, and in written comments received after the meetings, local citizens and interest groups indicated very strong support for construction of the proposed levee system north of I-10. These same interests expressed the need for additional openings under I-10 and US 90. At the April 1985 public meeting and in a written statement, the MRA requested that an additional levee plan (Plan J) be investigated to provide flood protection for those areas located south of I-10. This alternative was investigated and included in the final array of alternatives, and appropriate discussions have been included in this document.

d. SCS expressed concerns about the impacts of levee construction on important agricultural lands, specifically the irreversible conversion of farmland to nonagricultural uses. In accordance with the Farmland Protection Policy Act (effective 6 August 1984), the Vicksburg District formally requested SCS assistance in a 28 May 1985 letter and in a subsequent meeting with the District Conservationist for St. Tammany Parish. According to Public Law 97-98, Farmland Protection Policy Act Guidelines, Part 658.4(a) (5 July 1984), the Vicksburg District assumes that the proposed action is in compliance with the Act.

e. A number of agencies, interest groups, and citizens have expressed concerns related to apparent unrestricted development within the 100-year base flood plain and question the use of Federal funds to protect development below the 100-year flood elevation. St. Tammany Parish participates in the National Flood Insurance Program (NFIP) which is administered by the independent government agency, Federal Emergency Management Agency (FEMA). This program requires that all new development in the parish be elevated above the base 100-year flood elevation. The St. Tammany Parish Police Jury is responsible for the enforcement of Local Ordinance Nos. 791 and 523. The Corps was directed by Congress to determine feasible flood damage prevention measures (see Appendix A).

f. EPA classified the draft EIS as lack of objection, but expressed concern about implementation and enforcement of more restrictive flood plain zoning and possible testing of borrow material. St. Tammany Parish enforces flood plain ordinance requiring new development to be elevated above the 100-year flood elevation. Existing data related to commercial sources of fill material have been reviewed, and there was no record of contaminants. Therefore, the fill materials were classified as Category 5--no further testing required.

g. The Louisiana Department of Natural Resources expressed concerns about the Coastal Zone Consistency Determination, specifically the impacts of levee construction on wetlands within the coastal zone (south of I-10). As a result of subsequent letters, discussions, and meetings, the Vicksburg District has included more detailed wetland descriptive data and a generalized vegetation map (Plate J-52) to clarify the impacts to the coastal wetlands of Louisiana.

12. REFERENCES

A listing of materials cited in the preparation of this document is presented in Appendix F.

13. INDEX

An alphabetized index with reference to the EIS, Main Report, and appendixes is presented in Table EIS-4.

TABLE EIS-4

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SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

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Areas of Controversy	EIS-4	Page 19	
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Cover Sheet	EIS Abstract	Syllabus	
Environmental Conditions	EIS-16	Page 12	Page F-4 and Page B-6
Environmental Effects	EIS-25	Page 39	Page F-20
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APPENDIX A
CONGRESSIONAL RESOLUTIONS, BILLS, AND ACTS

The following resolutions were adopted by the United States Senate and the House of Representatives pertaining to flood control studies in the Pearl River Basin. In addition, the Energy and Water Development Appropriation Bills of 1983 and 1984 specifically addressed the Slidell-Pearlington area.

RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report on Pearl River and tributaries, Mississippi, published as House Document Number 441, Eighty-sixth Congress, second session, with a view to determining whether any further improvement for flood control on Town Creek at Jackson, Mississippi, is warranted at this time.

Adopted April 1, 1963

RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report of the Chief of Engineers on Pearl River and tributaries, Mississippi, published as House Document Numbered 441, Eighty-sixth Congress, and other pertinent reports, with a view to determining whether any further modifications of the recommendations contained therein are advisable at the present time, with particular reference to provision of flood control and related improvements on Pearl River from Town Creek at Jackson, Mississippi, downstream to a point near Byram, Mississippi.

Adopted June 27, 1967

RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors be and is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, submitted in House Document Numbered 92-282, 92nd Congress, second Session and other pertinent reports with a view to determining the advisability of modifying any of the existing projects in the basin at this time with particular reference to providing dependable municipal and industrial water supply and a 12-foot navigation channel to the vicinity of Picayune, Mississippi.

Adopted March 12, 1974

RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Pearl River and Tributaries, Mississippi, contained in House Document Number 441, 86th Congress, with a view to determining whether measures for prevention of flood damages and related purposes are advisable at this time in Rankin County, Mississippi.

Adopted February 1, 1979

RESOLUTION

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, published as House Document Number 282, Ninety-second Congress, Second Session, and other pertinent reports, with a particular view toward determining whether any further improvements for flood damage prevention and related purposes are advisable at this time. The alternatives are to be reviewed with local interests to insure a viable, locally supported project.

Adopted May 9, 1979

RESOLUTION

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on the Pearl River and Tributaries, Mississippi, contained in House Document 441, 86th Congress, and other reports with a view to determining whether measures for prevention of flood damages and related purposes are advisable at this time, in Rankin County, Mississippi.

Adopted May 9, 1979

RESOLUTION

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review all reports concerning the Pearl River Basin, Mississippi and Louisiana, with a view toward enhancing the ecological conditions of the study area and insuring adequate surface water supplies to the lower Pearl River Basin to meet future demands.

Adopted May 9, 1979

RESOLUTION

Resolved by the Committee on Environment and Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, and is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana submitted in House Document Numbered 92-282, 92nd Congress, 2nd Session and other pertinent reports with a view to determining whether any further improvements for flood damage prevention and related purposes are warranted at this time.

Adopted May 9, 1979

House Report 98-207, Energy and Water Development Appropriations Bill, 1983, states:

> "The Committee is concerned that the corps does not anticipate completing their final Slidell-Pearlington portion of the Pearl River study until September 1987. The corps is directed to provide the committee, prior to the consideration of the annual 1984 appropriations bill, the capability funding needed to complete, within a year, the detailed feasibility design for a levee in the Slidell area and other flood control alternatives for both Slidell and Pearlington. Furthermore, the committee directs the corps to furnish the committee with an interim report on the status of the study every 60 days."

House Report 98-217, Energy and Water Development Appropriation Bill, 1984, states:

> "The Committee continues to be concerned with the devastating flood problems in the Pearl River Basin and the development of flood control alternatives for both the Slidell, Louisiana, and Pearlington, Mississippi, areas. To insure completion of the Slidell-Pearlington study in FY 1984, the Committee provided funds in the Energy and Water Development Supplemental Appropriations Act of 1983 to use in expediting the study. The Committee is now providing $1,200,000 to complete the detailed feasibility design for a levee in the Slidell, Louisiana, area and other flood control alternatives for both Slidell and Pearlington."

(NOTE: The $1.2 million provided in the Energy and Water Development Appropriations Bill for Fiscal Year 1984 was utilized for ongoing studies in the Pearl River Basin, including the Jackson, Mississippi, and the Slidell-Pearlington flood control studies and navigation studies on the lower Pearl River.)

Supplemental Appropriations Act, Fiscal Year 1985 (Public Law 99-88), states:

> "The Secretary of the Army acting through the Chief of Engineers is authorized and directed to proceed with planning, design, engineering, and construction of the following projects substantially in accordance with the individual report describing such project as reflected in the Joint Explanatory Statement of the Committee of Conference accompanying the Conference Report for H.R. 2577 (List of Projects includes Pearl River, Slidell, St. Tammany Parish, Louisiana), Provided, that none of the funds herein appropriated may be expended to undertake such projects except under terms and conditions acceptable to the Secretary of the Army (or under terms and conditions provided for in subsequent legislation when enacted into law) as shall be set forth in binding agreements with non-Federal entities desiring to participate in project construction. Each such agreement shall include a statement that the non-Federal entities are capable of and willing to participate in project cost-sharing and financing in accordance with terms of the agreement. At such time as the Secretary has executed a formal binding agreement and has determined that the non-Federal entities' financing plan demonstrates a reasonable likelihood of the non-Federal entities' ability to satisfy the terms and conditions of the agreement, the Secretary shall initiate construction at a project in accordance with such agreement: Provided, further, that the funds appropriated herein shall lapse on June 30, 1986, if the agreement required herein for that project has not been executed."

The Joint Explanatory Statement of the Committee of Conference accompanying the Conference Report for H.R. 2577 (Public Law 99-88), states:

> "Pearl River, Slidell, St. Tammany Parish, LA.--The City of Slidell and other communities in St. Tammany Parish, Louisiana, have experienced three floods of record since 1979 resulting from high stages on the Pearl River. In April 1983, record stages occurred, devastating numerous businesses and as many as 1,000 homes causing over $100,000,000 in damages. Investigations being finalized by the Corps of Engineers indicated that a number of measures could reduce flood damage, including channel modifications, levees, drainage structures and bridge modifications.
>
> Floods damage relief is critically needed in this--the fastest growing area of Louisiana. The Corps of Engineers is directed to expedite measures to reduce this flooding problem and within available funds is directed to undertake such structural and nonstructural measures as deemed feasible to prevent flood damage to communities in the Pearl River Basin, St. Tammany Parish, Louisiana. (Draft Report of the District Engineer, Vicksburg, dated March 1985.)"

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX B
ECONOMIC ANALYSIS

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SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX B
ECONOMIC ANALYSIS

INTRODUCTION

1. This appendix presents information pertaining to the economic evaluation of proposed water resource improvements in the Slidell, Louisiana, and Pearlington, Mississippi, urban area. Information and computations presented describe the methodology used in determining benefits under existing and future conditions. The economic evaluation is based on a project life of 100 years, a discount rate of 8-5/8 percent, October 1985 price levels, and an estimated project completion date of 1991.

GENERAL

2. For purposes of determining the need for a greater level of protection for the Slidell-Pearlington area, analyses were conducted to determine the economic effects of various alternative plans of improvement. Pertinent information consists of a description of the areas affected, discussion of the number of residents and properties affected, estimates of damages by category, and discussion of benefits with implementation of various plans for the areas.

3. Costs of alternative plans of improvement to provide higher levels of protection to the Slidell-Pearlington area are also presented. Benefits and costs were compared in the standard benefit-versus-cost manner.

4. Economic evaluation and analysis were accomplished taking into consideration the "without-project" and "with-project" conditions. The without-project condition for this analysis is the condition expected to prevail in the absence of any alternative plan of improvement considered in the study and is the same as the alternative of "no action."

5. Detailed descriptions of each alternative for improvement are presented in the main report.

PROJECT AREA

LOCATION

Slidell, Louisiana

6. The project area is located in the southeastern portion of the State of Louisiana. The project area, or the area that would be affected by construction of water resource improvement plans, consists of the area bounded by the

West Pearl River on the east, Interstate 10 on the west, and Lake Pontchartrain on the south. This triangular area is immediately east of Slidell proper.

7. Slidell is the leading retail center within the area. It has shown steady population growth since 1950 and represented 24 percent of St. Tammany Parish's total population in 1980. Growth in the labor force roughly paralleled population growth in the parish. The combined category of retail and wholesale trade is the largest contributor to employment in the parish. Of the two subcategories, retail trade has experienced the greatest growth in recent years. Further detailed discussion is presented in the socioeconomic profile in Attachment 1 to this appendix.

8. For analysis purposes, this study area was divided into three areas. The uppermost area is a single residential subdivision called the Cobb-Hammock area. The second or middle area was designated as "Above Interstate 10" and consists of several subdivisions, single residences, and commercial establishments. The third and lower most area was designated as "Below Interstate 10" and contains all areas between Interstate 10 and Fritchie Marsh.

9. During preliminary investigations, a project in the Cobb-Hammock area was determined to be economically infeasible; therefore, this area was eliminated from further consideration.

Pearlington, Mississippi

10. Pearlington is located about 12 miles east of Slidell in the lower southwestern portion of Mississippi along the eastern edge of the East Pearl River. The community is unincorporated; therefore, historical and statistical data are unavailable for the area. Preliminary investigations indicated a project in this area was not economically feasible; therefore, this area was eliminated from further consideration.

Pearl River, Louisiana

11. The Pearl River community is located approximately 5 miles north of Slidell along U. S. Highway 11 and Interstate 59. This incorporated community of approximately 1,200 people lies adjacent to one of the tributaries of the West Pearl River. Preliminary investigations indicated a project in this area was not economically feasible; therefore, this area was eliminated from further consideration.

DESCRIPTION

12. A detailed description of the study area is presented in the Existing Conditions section of the Main Report and in the Economic Base and Land Use Study, Slidell, Louisiana, and Pearlington, Mississippi. The Slidell-Pearlington area is characterized by flat coastal plains and marshlands. The

climate is generally mild, with an average annual temperature of about 69 degrees F. Average monthly temperatures range from 49 degrees F in the winter to about 83 degrees F in the summer. The average monthly rainfall ranges from 3 inches in September to about 6 inches in January with a mean annual average of approximately 60 inches.

PROBLEMS

13. The Slidell-Pearlington area has experienced severe flooding problems in the last few years. A large portion of the area is subject to periodic shallow flooding caused by the inability of the storm drainage system to handle runoff from large storms. Natural drainage for Slidell is through Gum Bayou, French Branch, and Doubloon Bayou. In addition, severe flooding occurred from the West Pearl River in 1979, 1980, and 1983.

ALTERNATIVE PLANS OF IMPROVEMENT

14. Several alternative measures to reduce flood damages in the Slidell-Pearlington urban area were investigated. They are addressed in general terms in the following paragraphs and are described in detail in the main report.

NONSTRUCTURAL ALTERNATIVES

15. Nonstructural alternatives, which include floodproofing, structure raising, relocation, acquisition and demolition, and construction of small walls, were evaluated. However, the nonstructural alternatives provide only a limited solution to the major flood problems in the Slidell-Pearlington area. Results of the complete analysis of the nonstructural alternatives appear later in this appendix.

STRUCTURAL ALTERNATIVES

16. Structural solutions to the problems and needs of the Slidell-Pearlington area were considered and consisted of several levee designs and associated pumping plant sizes and locations. Construction costs, rights-of-way limitations, relocations, and environmental impacts were derived in evaluating the various alternatives. Various levee plan combinations were considered for Slidell, Pearlington, and the Pearl River community.

17. Due to the large number of alternatives considered and the volume of data generated in this analysis, it would be impractical to display all data. Therefore, damages and benefits displayed in this appendix will be presented for the national economic development (NED) plan for each of the two levee alignments (Plan A--Above Interstate 10; Plan E--Below Interstate 10). Summary information on other plans is also presented in summary tables at the end of this appendix.

FLOOD DAMAGES AND
WITHOUT-PROJECT COSTS

18. Field investigations were conducted to determine the extent and character of flooding and flood damages. "Without-project" reflects existing conditions in the Slidell-Pearlington urban area. "With-project" conditions reflect conditions in the area when a selected alternative to alleviate urban flooding problems is in place. An evaluation of urban properties indicates that major flood losses or damages occur to urban properties, automobiles, and public roads and bridges. Flood damage evaluation was accomplished by examination of aerial photographs and hydrologic data, compilation of field survey data, and the use of applicable flood analysis curves to convert damages to an average annual basis. Flood analysis curves depict the relationship between the stage and area inundated, stage and frequency of occurrence, stage and damage, and damage and frequency of occurrence. The evaluation is based on the period of economic analysis (1992-2091)--the period beginning with the first full year of project benefits and continuing throughout the economic life of the project.

DAMAGE TO URBAN PROPERTY

19. Determination of flood damage to residential, commercial, industrial, and other properties within the affected areas included an inventory (survey) to determine structural data, analysis of appropriate hydrologic data, and utilization of computer analysis to calculate flood damages to various types of structures and their contents under existing conditions for the various plans of improvement. The stage/damage data incorporated in the computer program are based on survey data which indicate, for a particular structure value and type, the amount of flood damage sustained with a given depth of flooding--including damage to the structure (damage to foundation, walls, etc.) and damage to contents (furniture, floor coverings, etc.)

20. A field survey or inventory was conducted to obtain data for the following categories: residential, commercial, industrial, public, semipublic, etc. Information obtained for each property category, which was utilized as input to the computer program, included: number of structures, structure floor elevation, number of stories, type of construction, use, and estimated structure value. The value of land was excluded in the determination of structure values. Other computer program input consisted of applicable hydrologic data (elevations or depths of flooding) and estimated contents percentages (contents or furnishings and equipment as a percent of structure value) for the various property categories. Depth-damage data for various structure types and structure uses are incorporated into the computer program. Depth-damage relationships for the residential structures were developed by the

Huntington District, and the nonresidential relationships were developed by Stanford Research Institute (SRI). Because of the time constraint and monetary requirement of developing site-specific depth-damage relationships, it was determined that utilization of the Huntington District and SRI curves provide an acceptable degree of accuracy and would be more time and cost effective.

21. Based on input of hydrologic data (estimated elevations of specific flood frequencies for applicable areas) and floor elevations of affected structures, the computer program determines depths of flooding for each structure and calculates estimated contents and total structure/content values per structure utilizing the input of structure value and input of percentages for contents value. Flooding depth data are then used in conjunction with programmed stage/damage data for specific structure use and type construction to calculate structure and contents damage.

22. Damage to contents was calculated with contents based on a percentage of structural value. Content value was then added to structural value to derive the total damageable value. For residential structures, contents were considered to be 50 percent of structure value. Projected urban residential damage values are based on application of an affluence factor (maximum of 75 percent of structure value) to damages for without- and with-project conditions. This factor reflects value of property subject to damage which is associated with anticipated increases in per capita income. The numbers of structures by type in the project area are presented in Table B-1.

TABLE B-1

ESTIMATED NUMBER OF STRUCTURES, BY TYPE AND AREA,
SUBJECT TO FLOODING BY A STANDARD PROJECT FLOOD
EXISTING AND FUTURE DEVELOPMENT
SLIDELL, LOUISIANA

Type of Structure	Slidell Area			
	Plan A (Above Interstate 10)		Plan E (Below Interstate 10)	
	Existing	Future	Existing	Future
Residential	778	2,078	2,407	5,394
Nonresidential a/	22	N/A	171	N/A

a/ Nonresidential includes all commercial, public, semipublic, etc.

23. Land development within the study area has been projected to continue at current levels without or with the project. Slidell is commonly referred to as a "bedroom community of New Orleans." Since the I-10 system linking Slidell to New Orleans was completed in the late 1960's, urban development (primarily residential) has increased by more than 200 percent in the Slidell project area while the parish-wide increases for this same period were less than 60 percent. This growth, primarily in the West Pearl River flood plain, can be attributed to several reasons. The location of the area is such that within 5 minutes or less a person can access I-10 and within 45 minutes or less can be in downtown New Orleans. Also the infrastructure already exists to allow development of this area. A large number of families building or buying in the Slidell area are former residents of New Orleans who have moved to Slidell to obtain better school systems and to escape higher taxes, higher crime rate, and the overcrowding normally associated with large metropolitan areas. Another reason in the esthetics of the West Pearl River area is the majority of the residential development in this area consists of exclusive subdivisions located adjacent to the West Pearl River. This location provides the residents easy access to the West Pearl River and the adjacent wildlife management areas for boating, hunting, fishing, and other recreational activities.

24. Because of these demands in the area, residential development will continue until full development is reached with or without the project in place and plans have been evaluated accordingly. However, it is recognized that with the project implemented, the potential exists for the rate of development to increase somewhat.

Assessment of Present Land Use in Flood Plain

25. Present development and land use were identified and categorized for the affected land area. This analysis and the results are presented in the Slidell, Louisiana-Pearlington, Mississippi, Economic Base and Land Use Study. Soils in the study area are poorly drained coastal soils formed from repeated inundations by the Pearl River and marshlands. Land is generally flat, with slopes averaging approximately 0.5 foot per mile. Activities desiring to use the flood plain are currently doing so without the protection which would be provided by some of the alternative plans.

Assessment of Most Probable Future Land Use in Flood Plain

26. In assessing future land use, consideration was given to flood zoning laws currently in effect for the Slidell-Pearlington urban area. Flood zoning laws or building codes have been in effect for several years, and city and parish officials cooperate in enforcing these codes relative to construction in designated flood-prone areas. New structures to be located in the designated flood-prone portions of the urban area must meet established requirements to protect the structure from the 100-year flood.

27. In assessing future land use, the with-project condition is considered to be the same as the without-project condition. Development is currently taking place in areas now subject to flooding that would receive protection with project construction. Flood plain management and the provisions of the Flood Disaster Protection Act of 1973 (Public Law 93-234) are also recognized in the assessment.

Identification of Data on Value of Residential Structures and Contents

28. The values of existing residential structures and contents in the study area for existing (1986) conditions were obtained through real estate appraisals. Values for each category of residential property, excluding the value of land, are presented in Table B-2 for the Slidell-Pearlington urban area.

TABLE B-2
ESTIMATED VALUE OF RESIDENTIAL STRUCTURES AND
CONTENTS SUBJECT TO FLOODING BY STANDARD PROJECT FLOOD
(EXISTING CONDITIONS)
SLIDELL, LOUISIANA

Area	Type of Residential Structures	Number of Residential Structures	Average Value of Residential Structure	Average Value of Residential Contents [a/]
Slidell				
Plan A (Above I-10)	Brick	420	89,600	44,800
	Frame	158	29,100	14,600
	Mobile Home	200	6,900	3,500
Plan E (Below I-10)	Brick	1,457	69,800	34,900
	Frame	401	31,800	15,900
	Mobile Home	549	7,100	3,600

---

a/ Average value of contents as a percent of structure value is equal to 50 percent.

Application of "Affluence Factor"

29. Adjusted unit flood damages were obtained by application of the "affluence factor" to unit damages. The affluence factor (i.e., increase in projected per capita income) was used to increase the future real value of residential contents. In compliance with ER 1105-2-40, values of residential contents were projected to a maximum level of 75 percent of the value of residential structures and were held constant thereafter over the remaining period of analysis. Table B-3 reflects unit flood damages for without-project conditions without use of the affluence factor. Table B-4 reflects unit flood damages under without-project conditions with the application of the affluence factor.

Future Flood Damages

30. Future structure damages were evaluated taking into consideration residential lot sizes, development trends, housing values, and content values. Because of the affluence of area residents and quality of new housing being constructed, a content value of 75 percent was used for all future development. Based on residential development trends and lot sizes for the area, all lands available for development within the area protected by the proposed levees would be fully developed by the year 2003.

31. In evaluating future residential development trends for the Slidell area, the number and average size of lots were determined from subdivision plat maps obtained from the Engineering Department, St. Tammany Parish, Slidell, Louisiana. Using this data two analyses were conducted, one utilizing the overall study area to determine an average lot size and another utilizing only the area protected by the levees. Analyzing the entire study area resulted in 2.1 structures per acre or a lot size of 0.48 acre. Analyzing only the area protected by the proposed levees resulted in 1.74 structures per acre or a lot size of 0.58 acre. Based on field observations, 1.74 structures per acre is considered more appropriate and was used to project future residential development. Residential building permits for the period 1978 through 1985 were then analyzed to establish a basis for the development trend for the Slidell study area. The analysis of the 1978-1985 data reflects an average of 240 residential structures per year were built during this period for the protected area and an average of 454 residential structures per year in the study area. It should be noted that because of the predominance of residential construction in the project area, commercial development (i.e., nonresidential) will have no significant effect on project formulation or justification. Therefore, future commercial development trends were not analyzed.

32. The residential development trends were used in projecting flood damages for structures. For the area protected by Plans A and E, a damage per structure was developed by averaging the annual damages to residential structures which were built during the 1984-1985 period. This resulted in an average annual damage per structure of $295 and $262, for Plans A and E, respectively. The future structure damages were then computed by multiplying the total number of new structures that would be constructed within the protected area by the appropriate average annual damage for each structure. It should

TABLE B-3
EXISTING AND FUTURE UNIT FLOOD DAMAGES
RESIDENTIAL PROPERTIES, EXISTING CONDITIONS
WITHOUT PROJECT AND WITHOUT AFFLUENCE FACTOR [a]
SLIDELL, LOUISIANA

Area	Type of Residential Structures	Existing Unit Flood Damages 1986	Projected Unit Flood Damages (Without Affluence Factor) [b]		
			1992	2001	2011-2091
Slidell					
Plan A (Above Interstate 10)	Brick	367	N/A	N/A	N/A
	Frame	440	N/A	N/A	N/A
	Mobile Home	100	N/A	N/A	N/A
	Total	313	307	302	302
Plan E (Below Interstate 10)	Brick	388	N/A	N/A	N/A
	Frame	464	N/A	N/A	N/A
	Mobile Home	194	N/A	N/A	N/A
	Total	356	328	306	304

---

[a] Unit flood damages were obtained by dividing the estimated average annual damage by type of structure by the estimated number of structure affected by type.

[b] Projected flood damages by types of future residential structures were not developed.

TABLE B-4
EXISTING AND FUTURE UNIT FLOOD DAMAGES RESIDENTIAL PROPERTIES, EXISTING CONDITIONS WITHOUT PROJECT BUT WITH AFFLUENCE FACTOR a/
SLIDELL, LOUISIANA

Area	Type of Residential Structures	Existing Unit Flood Damages 1986	Projected Unit Flood Damages (Without Affluence Factor) b/		
			1992	2001	2011-2091
Slidell					
Plan A					
(Above Interstate 10)	Brick	367	N/A	N/A	N/A
	Frame	440	N/A	N/A	N/A
	Mobile Home	100	N/A	N/A	N/A
	Total	313	321	324	322
Plan E					
(Below Interstate 10)	Brick	388	N/A	N/A	N/A
	Frame	464	N/A	N/A	N/A
	Mobile Home	194	N/A	N/A	N/A
	Total	356	345	334	330

---

a/ Unit flood damages were obtained by dividing the estimated average annual damage by type of structure by the estimated number of structure affected by type.

b/ Projected flood damages by types of future residential structures were not developed.

be noted that future flood damages were not projected for the areas outside of the levees (i.e., Plans A and E). Therefore, the existing and future damages and benefits are shown only for the protected areas.

Total Structural Damages

33. The total structural flood damages under without-project conditions were obtained by applying the estimated number of development units in the study area to the unit flood damages. Table B-5 presents the total residential flood damages for the Slidell-Pearlington area for without-project conditions.

TABLE B-5
TOTAL ADJUSTED STRUCTURAL DAMAGES
WITHOUT PROJECT[a]
SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

Area	Structure Type	Annual Flood Damages for Current Year	Projected Future Flood Damages[b]		
		1986	1992	2001	2003-2091
Slidell					
Plan A (Above I-10)	Residential	243,514	388,011	624,509	668,169
	Nonresidential[d]	156	156	156	156
	Total	243,670	388,167	624,665	668,325
Plan E (Below I-10) [c]	Residential	856,892	1,181,731	1,703,544	1,781,882
	Nonresidential[d]	10,870	10,870	10,870	10,870
	Total	867,762	1,192,601	1,714,414	1,792,752

---

[a] Values may differ when multiplying unit flood damages and number of structures affected due to rounding of unit flood damage figures.

[b] Increases in flood damages reflect effects of affluence factor to existing structures, as well as expected damages to new structures above the 100-year flood frequency.

[c] Values include the effects of hurricane analysis.

[d] Damages for nonresidential future structures were not projected.

DAMAGES TO PUBLIC ROADS AND BRIDGES

34. The overall analysis of road and bridge damages involved determining the number of miles of streets adversely impacted by frequency and the application of these data to a loss per unit value for various types of facilities involved. Aerial photographs, topographic maps, hydrologic data, and a delineation of the areas affected were utilized in this analysis.

35. Various flood frequencies were delineated on quad maps of the area. The number of miles of streets that would be affected by flooding at the various frequencies were measured. For the Slidell area above I-10, the average annual miles damaged for 1984, 1992, and 2001 are 1.8, 2.9, and 3.8 miles, respectively. For the Slidell area below I-10, the average annual miles damaged for 1984, 1992, and 2001 are 4.1, 6.3, and 8.4 miles, respectively. The increase in average annual miles damaged reflects an increase in the number of new roads and streets that will be built to accommodate new residential development. These data were then combined with a damage-per-mile factor. The damage-per-mile factor was derived from detailed surveys of similar areas following previous floods and from information derived in other feasibility studies. The per-mile figure of $21,300 (October 1973) was updated using the ENR index (2.19) resulting in an October 1985 value of $46,700. This value is a composite of costs of repair to roadbeds, shoulder work, pavement replacement, bridge approach replacement, bulkhead repair, etc. The October 1985 value was comparable to the updated 1985 values of several other feasibility studies that were analyzed. Because this figure ($46,700) was a composite of all these factors and effectively represented the area under study, it was selected for use. The damage per mile remains constant throughout the study period.

36. In order to calculate these damages, stage-frequency and stage-damage curves were developed for each area. Average annual existing damages were calculated utilizing appropriate computer analysis. Damages were projected based on the ratio of increase in population over the period of analysis and were discounted to present worth for each of the plans of improvement under consideration. Road and bridge damages are displayed in Table B-6.

TABLE B-6
ROAD AND BRIDGE DAMAGE
EXISTING AND FUTURE
WITHOUT PROJECT
SLIDELL, LOUISIANA
($000)

Area	Existing	Projected Damages					
	1986	1992	2001	2011	2021	2031	2041-2091
Slidell							
Plan A (Above I-10)	87	137	178	178	178	178	178
Plan B (Below I-10) [a]	191	301	391	391	391	391	391

[a] Values include effects of hurricane analysis.

DAMAGES TO AUTOMOBILES

37. Research by the South Atlantic Division established that the potential for damages to automobiles does exist during a flood event.

38. Since a flood event rarely occurs at the optimum time for all persons affected, the potential for damage to automobiles would exist to some degree for most major flood events. For inundation-only type flood events (all except where high velocity occurs), a factor of 10 percent was determined by the Baltimore District. Within this study, the depth of flooding in the study areas could cause some automobiles to have a higher percentage of damage than others. It was determined that the average damage per automobile was an average value of several flood depths and represented potential damage values. These values combined with the other factors result in a relatively small value for the damage potential which actually could exist.

39. The overall analysis of automobile damages involved determining the number of units adversely impacted and the application of these data to a loss per unit value. Estimation of the average number of automobiles per household was accomplished utilizing various data elements. These data include number of households affected, average number of persons per household, average number of automobiles per household, number of automobiles assumed to be damaged, and an average damage per automobile ($596 developed by Baltimore District and South Atlantic Division and updated to a 1985 price level).

40. Stage-frequency and stage-damage curves were developed for each area. These data were combined with a computer analysis utilizing standard economic methodology to determine the annual existing damages. Damages were projected based on the ratio of increase in population for the period of analysis. Automobile damages are displayed in Table B-7.

TABLE B-7
AUTOMOBILE DAMAGE
EXISTING AND FUTURE
WITHOUT PROJECT
SLIDELL, LOUISIANA
($000)

Area	Existing	Projected Damages					
	1986	1992	2001	2011	2021	2031	2041-2091
Slidell							
Plan A (Above I-10)	2	4	5	5	5	5	5
Plan E (Below I-10)[a]	13	18	26	26	26	26	26

[a] Values include effects of hurricane analysis.

EMERGENCY COSTS

41. Emergency costs include those additional expenses resulting from a flood that would not otherwise be incurred. Emergency costs encompass a wide variety of programs and activities including such items as evacuation and

reoccupation costs; floodfighting expenses; costs for emergency shelter and food for evacuees; state and Federal disaster relief; increased expense of normal operations during a flood; increased costs of police, fire, or military patrol; and losses due to abnormal depreciation of equipment or buildings. These are expenses or costs borne by affected residents and property owners, a local or state government or agency, or Federal agencies or national organizations. Since the majority of the floodfight effort in the Slidell area is on an individual structure basis and effectiveness in future floods cannot be determined, the flood damage analysis assumes no effective floodfight when computing flood damages to structures. Therefore, the counting of floodfighting benefits of the emergency costs represents a potential double counting of benefits, assuming an effective floodfight. The removal of these benefits will not affect plan formulation as they represent less than 1 percent of the total benefits.

42. Some expenses such as evacuation, reoccupation, individual floodfighting efforts and abnormal depreciation are borne largely by affected individual residents and property owners, while others are generally borne by local, state, or Federal agencies and organizations. Organizations such as the American Red Cross incur significant costs relating to providing emergency shelter, food, and other items for flood victims.

43. Emergency costs were calculated based on the number of households affected combined with a cost per household of $809. This value reflects an average cost of the above-mentioned expenses developed through research with various relief organizations. Emergency cost data were taken from survey information collected for previous flooding in other areas. Data used included county level surveys of expenditures by household for the above-mentioned expenses. This information was updated to October 1985 price levels by using the ENR Index, yielding emergency expenditures of $809 per household. These data were combined with stage-frequency curves and number of households to develop stage-damage curves for each area used in determining the annual existing damages. These damages were projected based on the ratio of increase in population for the period of analysis and are displayed in Table B-8.

TABLE B-8
EMERGENCY COSTS
EXISTING AND FUTURE
WITHOUT PROJECT
SLIDELL, LOUISIANA
($000)

Area	Existing	Projected Damages					
	1986	1992	2001	2011	2021	2031	2041-2091
Slidell							
Plan A (Above I-10)	30	43	62	62	62	62	62
Plan B (Below I-10)[a]	148	216	287	287	287	287	287

[a] Values include effects of hurricane analysis.

INSURANCE PREMIUM COSTS

44. The National Flood Insurance Program was enacted by Congress in 1968. The purpose of the program was to make flood insurance, which was previously unavailable from private insurance companies, available at reasonable rates through a joint Government-industry program. Communities must meet eligibility requirements by adopting certain flood plain management regulations. These must be consistent with Federal criteria and reduce or avoid flooding in connection with future construction in their flood plains.

45. The program is highly subsidized and seeks in its early stages to assure wiser future flood plain management rather than to obtain adequate premiums for the coverage provided. Communities entering the program generally do so in two stages. They first become eligible under the Emergency Program which offers only half the program's coverage limits. Secondly, they can enter the Regular Program after a flood insurance rate study has been conducted. Under the Regular Program, full coverage limits are available.

46. Once a plan of improvement has been put in place, the costs of administering flood insurance policies can be reduced. The savings of these costs can be considered as a benefit to the project. Currently, the overhead cost per policy is $50, and total benefits can be derived simply by multiplying the overhead cost by the number of structures affected below the 100-year flood frequency for both without- and with-project and computing the difference.

RESIDENTIAL SITE DEVELOPMENT COST

47. An area participating in the Federal Flood Insurance Program must enforce the regulations stating that any new construction be built above the 100-year flood elevation. Under certain circumstances, the added costs of preparing a house site for construction can be quite expensive. With a flood removal plan in place, the 100-year elevation will be lower than existing conditions. Then the savings between the costs of site development under existing conditions and with-project conditions can be computed as a benefit to the project.

48. The residential site development costs for the Slidell area were originally computed based on detailed data that included the average structure size (2,200 square feet), average depth of landfill (2.83 feet above Interstate 10 and 2.64 feet below Interstate 10), and average price per yard of fill. The average structure size and average depth of landfill were computed based on approximately 600 observations which were representative of the total area.

49. In the initial evaluation contained in the feasibility report, a savings of approximately $2,000 per residential house site was used. This estimate was based only on the cost of fill material to elevate each structure. Coordination with local contractors indicates a cost of $2,700 per site to be more appropriate. This cost includes fill material, hauling, shaping, and compacting. In addition, it was determined that when elevating a structure higher than 2.5 to 3.0 feet, fill is not acceptable and post piles or brick piers are commonly used. Coordination with local contractors in the area shows that the cost of raising a structure using creosote post piles or brick piers with concrete footing will add about $5,000 to $10,000 to the cost of a typical home. Therefore, a value of $7,000 was used for all homes raised by the piles or brick piers. Analyzing the flood plain lands available for development and the existing structures that are within the flood plain, it was determined that 20 percent of the future structures would be elevated using piles or brick piers while 80 percent of the future structures could be elevated using fill.

50. Computation of the reduction in residential site development costs for without- and with-project conditions was accomplished by combining the average cost per acre for the appropriate area with the acres available for development with each levee alignment. The number of acres available for development under existing conditions was determined by identifying the existing areas suitable for development less that portion of this acreage previously developed. Under with-project conditions, additional acres required for sump areas were also excluded. Some vacant acreage within the existing urban areas is not considered, but these areas are a very small percentage of the acreage available for development. Due to the desirability and esthetics of the project area, the existing infrastructure, the excellent school system, and the ease of access to New Orleans via I-10, the residential site development costs have not hampered development in the project area. For these reasons, residential subdivision lots in the project area are actually selling from $3,000 to $5,000 higher than similar lots elsewhere in St. Tammany Parish.

TOTAL DAMAGE

51. Total average annual damages by alternative for existing and future development conditions within the Plan A and Plan E areas are summarized in Tables B-9 and B-10.

TABLE B-9
TOTAL AVERAGE ANNUAL FLOOD DAMAGES, BY CATEGORY
EXISTING AND FUTURE WITHOUT- AND WITH-PROJECT CONDITIONS
SLIDELL, LOUISIANA
PLAN A
($000)

Item	Category				Total
	Structures	Road and Bridge	Emergency Costs	Automobiles	
1986 Existing					
Without Project	244	87	30	2	363
With Project	10	6	3	0	19
1992 Projected					
Without Project	388	137	43	4	572
With Project	11	8	4	0	23
2001 Projected					
Without Project	625	178	62	5	870
With Project	12	11	6	0	29
2003 Projected					
Without Project	668	178	62	5	913
With Project	12	11	6	0	29
2011-2091 Projected					
Without Project	668	178	62	5	913
With Project	12	11	6	0	29

TABLE B-10
TOTAL AVERAGE ANNUAL FLOOD DAMAGES, BY CATEGORY
EXISTING AND FUTURE WITHOUT- AND WITH-PROJECT CONDITIONS
SLIDELL, LOUISIANA
PLAN E
($000)

Item	Category				Total
	Structures	Road and Bridge	Emergency Costs	Automobiles	
1986 Existing					
Without Project	868	191	148	13	1,220
With Project	12	31	27	2	72
1992 Projected					
Without Project	1,193	301	216	18	1,728
With Project	14	46	41	3	104
2001 Projected					
Without Project	1,714	391	287	26	2,418
With Project	16	61	55	5	137
2003 Projected					
Without Project	1,792	391	287	26	2,496
With Project	16	61	55	5	137
2011-2091 Projected					
Without Project	1,792	391	287	26	2,496
With Project	16	61	55	5	137

BENEFITS

GENERAL

52. The benefits presented in this section reflect the various plans of improvement which were formulated for the project area. As required by EC 1105-2-128, benefits are based on the period of economic analysis, the period beginning with the estimated initial project operation date and continuing throughout the economic life of the project (1992-2091).

BENEFIT CATEGORIES

53. Flood control benefits for this study consist of flood damage reduction and reduction in costs associated with flooding. This reflects damage reduction to development expected under existing conditions at the beginning of project operation and the reduction of damage to additional development without project installation.

EXISTING AND FUTURE BENEFITS

54. Existing and future flood control benefits were determined for urban properties, public roads and bridges, automobiles, and emergency costs affected by the plans of improvement. All benefits were discounted to determine present worth and were amortized over the project life to determine average annual values for each benefit category. Benefits are based on a project economic life of 100 years, and discount rate of 8-5/8 percent.

INUNDATION BENEFITS

Flood Damage Reduction

55. Benefits from flood damage reduction reflect the difference between without- and with-project conditions for each benefit category (urban property, public road and bridge, and automobile). Appropriate discounting procedures were then applied to convert future values to present worth value.

Cost Reduction Benefits

56. Benefits from reduction in costs reflect the difference between without- and with-project conditions for each cost reduction benefit category (emergency costs, insurance premium administration, and site development). Appropriate discounting procedures were then applied to convert future values to a present worth value.

REDEVELOPMENT BENEFITS

57. Redevelopment benefits credited to the relief of unemployment and underemployment are allocated only to those parishes which are eligible for aid pursuant to the Economic Redevelopment Administration, U. S. Department of Commerce. Since the Slidell-Pearlington study area lies totally within St. Tammany Parish, Louisiana, and Hancock County, Mississippi, neither of which is a designated parish or county, no redevelopment benefits were attributed to the project.

TOTAL FLOOD CONTROL BENEFITS

58. Benefits will result from flood damage reduction to residential, commercial, and other properties; public roads and bridges; automobiles; emergency costs; reductions of insurance premium administration cost; and residential site development costs. Total average annual benefits by category by alternative for the 200-year level of protection are displayed in Table 8-11.

TABLE 8-11
TOTAL AVERAGE ANNUAL FLOOD CONTROL BENEFITS,[a]
BY CATEGORY, BY ALTERNATIVE
SLIDELL, LOUISIANA
($000)

Alternative	Category						
	Urban Structure	Road and Bridge	Emergency Costs	Automobile	Residential Site Development	Insurance Premiums	Total
Plan A (50-cfs)	565	155	51	5	134	23	933
Plan E (250- and 15-cfs)	1,583	306	217	20	328	93	2,547

[a] Benefits are based on an interest rate of 8-5/8 percent and a 100-year project life.

FLOOD WITH TWO-TENTHS OF 1 PERCENT CHANCE OF OCCURRENCE

59. In the event the 500-year frequency flood should occur, major catastrophic damages would result without the recommended plan in place. Standard project flood damages in the amount of $54.7 million would result. Approximately 3,265 homes and businesses would be affected. The resulting loss of power, sewer, water, and other utilities would affect approximately 9,800 persons within the study area.

BENEFITS TO FREEBOARD

60. Benefits to freeboard on a levee are a valid benefit category and may be claimed toward project justification. A simple and acceptable method of computing these benefits is to include one-half of the area under the frequency damage curve between the design level of protection and the largest flood that may be carried within the freeboard. The benefits to freeboard are included in the evaluation of the recommended plan.

ECONOMIC JUSTIFICATION

STANDARD ANALYSIS

61. Three different levels of protection (100-year, 200-year, and SPF) and numerous pump combinations were evaluated for each plan. The results of the standard economic (i.e., pump optimization) analysis for Plans A and E with a

200-year level of protection with offsite borrow are summarized in Tables B-13 and B-16. Information includes total project investment costs, annual costs, annual benefits, excess benefits over costs, and benefit-cost ratios. A similar analysis was also conducted for the 100-year and SPF levels of protection and are summarized in Tables B-12, B-14, B-15, and B-17. These data were used in determining the optimum size pump or pump combinations which were carried into the final array. For Plan A, a 50-cfs pump with floodgate would be the optimum plan. Plan A with 200-year protection would have annual costs of $752,000, excess benefits of $181,000, and a benefit-cost ratio of 1.2. For Plan E, a 250-cfs pump with floodgate on Doubloon Bayou and a 15-cfs pump with floodgate for the Cross Gates sump would be the optimum plan. Plan E with 200-year protection has excess benefits of $1,103,000, annual costs of $1.444 million, and a benefit-cost ratio of 1.8.

Nonstructural Measures

62. Section 73(a) of the Water Resources Development Act of 1974 (Public Law 93-251) requires that any Federal agency planning projects which involve flood protection shall give full and equal consideration to nonstructural alternatives to prevent or reduce flood damages. The following combinations of nonstructural measures were evaluated for various drainage areas in the Slidell-Pearlington area: floodproofing, construction of small walls, acquisition and demolition, relocation, and structure raising. Further discussion may be found in the Main Report under the section, "Nonstructural Alternatives," on page 23. The costs, benefits, excess benefits over cost, and benefit-cost ratios for the nonstructural alternatives providing 100-year protection to existing structures are presented in Table B-18. In addition, at the request of BERH, a 50-year nonstructural plan was evaluated for the area protected by Plans A and E; i.e., recommended plan area. The results of this analysis are presented in Table B-19. Based on the data contained in Tables B-18 and B-19, none of the nonstructural plans for existing structures were found to be economically feasible.

63. BERH considered the Slidell, Louisiana, and Pearlington, Mississippi, report on flood control at the meeting held 5 Mar 86. The Board requested that an additional study be undertaken to evaluate nonstructural plans involving the raising of future structural development above the 200-year and SPF levels. The results of this nonstructural analysis are contained in Attachment 2 to this appendix.

ADDITIONAL ANALYSES

64. In addition to the standard analysis, other analyses and several specific checks were made (sensitivity analysis) for growth rate of future residential structures, break-even years, internal rate of return, and value per structure).

Sensitivity Analysis for Growth Rate of Future Residential Structures

65. The benefit-cost ratio for the recommended plan is 0.7 under existing conditions, and when considering projected development of 240 residential structures per year, the overall benefit-cost ratio is 1.4 by the base year 1992. Since the recommended plan includes future development for economic

TABLE B-12
PLAN A - SPF PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST, AND BENEFIT-COST RATIOS
SLIDELL, LA

Alternative	Total Investment Cost [a/]	Annual Cost [b/]	Total Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Plan A - SPF					
Floodgates Only	8,278	743	745	2	1.0
15-cfs Pump	8,761	799	842	43	1.1
30-cfs Pump	8,909	816	913	97	1.1
50-cfs Pump	9,131	844	949	105	1.1
150-cfs Pump	10,107	945	954	9	1.0
250-cfs Pump	11,735	1,048	958	-90	0.9

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a/ Includes project first costs and interest during construction.
b/ Based on October 1985 price levels and 100-year project life.

TABLE B-13
PLAN A - 200-YEAR PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST,
BENEFIT-COST RATIOS
SLIDELL, LOUISIANA

Alternative	Total Investment Cost a/	Annual Cost b/	Total Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Plan A - 200-year					
Floodgate Only	7,221	652	734	82	1.1
15-cfs Pump	7,705	707	826	119	1.2
30-cfs Pump	7,851	724	896	172	1.2
50-cfs Pump	8,075	752	933	181	1.2
150-cfs Pump	9,050	854	938	84	1.1
250-cfs Pump	10,026	956	941	-15	1.0

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a/ Includes project first costs and interest during construction.
b/ Based on October 1985 price levels and 100-year project life.

TABLE B-14
PLAN A - 100-YEAR PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST, AND BENEFIT-COST RATIOS
SLIDELL, LA

Alternative	Total Investment Cost a/	Annual Cost b/	Total Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Plan A - 100-Year					
Floodgates Only	6,866	621	704	83	1.1
15-cfs Pump	7,342	675	795	120	1.2
30-cfs Pump	7,496	693	858	165	1.2
50-cfs Pump	7,719	721	892	171	1.2
150-cfs Pump	8,695	823	903	80	1.1
250-cfs Pump	9,671	925	906	-19	0.9

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a/ Includes project first costs and interest during construction.
b/ Based on October 1985 price levels and 100-year project life.

TABLE B-15
PLAN E - SPF PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST, AND BENEFIT-COST RATIOS
SLIDELL, LA

Alternative	Total Investment Cost a/	Annual Cost b/	Total Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Plan E - SPF					
Floodgates Only	13,812	1,192	1,976	784	1.7
15- and 150-cfs Pumps	15,981	1,469	2,394	925	1.6
15- and 250-cfs Pumps	16,957	1,571	2,600	1,029	1.7
15- and 500-cfs Pumps	19,410	1,808	2,689	881	1.5
15- and 700-cfs Pumps	21,322	2,001	2,771	770	1.4
15- and 1,000-cfs Pumps	23,904	2,268	2,817	549	1.2
30- and 150-cfs Pumps	16,129	1,487	2,399	912	1.6
30- and 250-cfs Pumps	17,105	1,588	2,606	1,018	1.6
30- and 500-cfs Pumps	19,558	1,825	2,694	869	1.5
30- and 700-cfs Pumps	21,470	2,018	2,774	756	1.4
30- and 1,000-cfs Pumps	24,051	2,284	2,824	540	1.2
50- and 150-cfs Pumps	16,352	1,512	2,401	889	1.6
50- and 250-cfs Pumps	17,328	1,612	2,608	996	1.6
50- and 500-cfs Pumps	19,781	1,851	2,697	846	1.5
50- and 700-cfs Pumps	21,693	2,043	2,779	736	1.4
50- and 1,000-cfs Pumps	24,275	2,309	2,827	518	1.2

---

a/ Includes project first costs and interest during construction.
b/ Based on October 1985 price levels and 100-year project life.

TABLE B-16
PLAN E - 200-YEAR PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST,
BENEFIT-COST RATIOS
SLIDELL, LOUISIANA

Alternative	Total Investment Cost [a/] ($000)	Annual Cost [b/] ($000)	Total Annual Benefits ($000)	Excess Benefits Over Costs ($000)	Benefit-Cost Ratio
Plan E					
Floodgate Only	12,237	1,056	1,926	870	1.8
15- and 150-cfs Pumps	14,406	1,330	2,341	1,011	1.8
15- and 250-cfs Pumps	15,382	1,444	2,547	1,103	1.8
15- and 500-cfs Pumps	17,835	1,672	2,631	959	1.6
15- and 700-cfs Pumps	19,742	1,865	2,709	844	1.5
15- and 1,000-cfs Pumps	22,198	2,120	2,755	635	1.3
30- and 150-cfs Pumps	14,554	1,350	2,347	997	1.7
30- and 250-cfs Pumps	15,637	1,461	2,553	1,092	1.7
30- and 500-cfs Pumps	17,983	1,688	2,637	949	1.6
30- and 700-cfs Pumps	19,896	1,882	2,714	832	1.4
30- and 1,000-cfs Pumps	22,476	2,148	2,762	614	1.3
50- and 150-cfs Pumps	14,777	1,375	2,348	973	1.7
50- and 250-cfs Pumps	15,753	1,476	2,554	1,078	1.7
50- and 500-cfs Pumps	18,206	1,715	2,641	926	1.5
50- and 700-cfs Pumps	20,120	1,906	2,718	812	1.4
50- and 1,000-cfs Pumps	22,700	2,173	2,766	593	1.3

[a/] Includes project first costs and interest during construction.
[b/] Based on October 1985 price levels and a 100-year project life.

TABLE B-17
PLAN E - 100-YEAR PROTECTION
PROJECT COST BENEFITS, EXCESS BENEFITS OVER COST, AND BENEFIT-COST RATIOS
SLIDELL, LA

Alternative	Total Investment Cost a/	Annual Cost b/	Total Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Plan E - 100-Year					
Floodgates Only	11,728	1,012	1,884	872	1.9
15- and 150-cfs Pumps	13,898	1,286	2,144	858	1.7
15- and 250-cfs Pumps	14,874	1,390	2,471	1,081	1.8
15- and 500-cfs Pumps	17,328	1,628	2,555	927	1.6
15- and 700-cfs Pumps	18,832	1,786	2,635	849	1.5
15- and 1,000-cfs Pumps	21,822	2,087	2,682	595	1.3
30- and 150-cfs Pumps	14,045	1,306	2,277	971	1.7
30- and 250-cfs Pumps	15,021	1,408	2,480	1,072	1.8
30- and 500-cfs Pumps	17,476	1,645	2,563	918	1.6
30- and 700-cfs Pumps	19,388	1,838	2,642	804	1.4
30- and 1,000-cfs Pumps	21,969	2,104	2,690	586	1.3
50- and 150-cfs Pumps	14,269	1,331	2,279	948	1.7
50- and 250-cfs Pumps	15,245	1,432	2,481	1,049	1.7
50- and 500-cfs Pumps	17,699	1,669	2,566	897	1.5
50- and 700-cfs Pumps	19,611	1,863	2,646	783	1.4
50- and 1,000-cfs Pumps	22,192	2,129	2,694	565	1.3

---

a/ Includes project first costs and interest during construction.
b/ Based on October 1985 price levels and 100-year project life.

TABLE B-18

FIRST COST, ANNUAL COST, ANNUAL BENEFITS, EXCESS BENEFITS OVER COST, AND BENEFIT-COST RATIO BY AREA BY NONSTRUCTURAL ALTERNATIVE

100-YEAR LEVEL OF PROTECTION

SLIDELL, LOUISIANA

Area/Alternative	First Cost ($000)	Annual Cost ($000)	Annual Benefits ($000)	Excess Benefits Over Costs ($000)	Benefit-Cost Ratio
Slidell (North of I-10)					
Floodproofing	3,335	292	100	- 192	0.3
Structure Raising	5,283	463	153	- 310	0.3
Small Walls	2,845	254	132	- 122	0.5
Relocation	11,182	980	68	- 912	0.1
Acquisition/Demolition	17,434	1,538	56	-1,482	0.0
Slidell (South of I-10)					
Floodproofing	9,535	813	297	- 516	0.4
Structure Raising	14,842	1,266	538	- 728	0.4
Small Walls	7,950	677	357	- 320	0.5
Relocation	31,492	2,686	350	-2,336	0.1
Acquisition/Demolition	48,198	4,110	229	-3,881	0.1

TABLE B-19
PLANS A AND E AREA
EXISTING STRUCTURES
50-YEAR NONSTRUCTURAL ALTERNATIVE PLAN
SLIDELL, LOUISIANA

Nonstructural Measure	First Cost	Annual Cost	Annual Benefits	Excess Benefits Over Costs	Benefit-Cost Ratio
	($000)	($000)	($000)	($000)	
Floodproofing	6,118	537	263	- 273	0.5
Structure Raising	8,958	786	261	- 525	0.3
Small Walls	4,903	430	263	- 167	0.6
Relocation	18,594	1,630	112	-1,518	0.1
Acquisition/Demolition	31,015	2,719	112	-2,607	0.1

justification, a sensitivity analysis was conducted. This analysis revealed that the average growth rate of 240 structures per year could be reduced to about 55 per year and still achieve an overall project benefit-cost ratio of 1.0.

Break-even Years

66. The break-even year analysis included two separate checks: (1) the project year in which undiscounted benefits first exceed annual costs, and (2) the project year in which discounted benefits exceed annual costs, assuming no further increases in benefits. Results of the break-even year analysis indicate what would be the first year in which undiscounted and discounted benefits exceed annual costs. The break-even analysis was conducted for Plans A and E, and the break-even year was 1992 for all plans.

Internal Rate of Return

67. The internal rate of return is the rate of interest at which annual benefits equal annual costs over the period of analysis (i.e., benefit-cost ratio equals 1.0). The internal rate of return was calculated for Plans A and E, and the results were 10.6 and 14.6 percent, respectively.

Discount Rate

68. The current Federal discount rate of 8-5/8 percent was used in project evaluation.

Value Per Structure

69. The value/structure check is not applicable for this study. Increases in urban structure and content damages are not based on increases in value, except for application of the affluence factor.

ATTACHMENT 1
APPENDIX B

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI SOCIOECONOMIC PROFILE

INTRODUCTION

1. The purpose of this attachment is to provide a profile of the economic and social structure of the project area. It is within this socioeconomic framework that damages would occur and benefits are to be achieved. Data are presented for past and present conditions and are expanded to include projections of conditions expected to exist in the future under existing growth conditions.

2. An economic base area consisting of St. Tammany Parish, Louisiana, and Hancock County, Mississippi, was established. Thus, this analysis incorporates social and economic data published on a parish-county basis. This project area, the area affected by the water resource plans of improvement, is confined within the cities of Slidell, Louisiana; Pearlington, Mississippi; and certain adjacent areas.

POPULATION

3. The number of persons living in an area signifies the economic opportunities available in that area as it relates directly to the amount of economic and industrial activity present. Therefore, it is used as an indicator of labor requirements in industry and commerce and reflects the extent to which these two business sectors have provided incentives for economic and population growth.

HISTORICAL TRENDS

4. Historical population trends for St. Tammany Parish and Hancock County (shown in Table 1) indicate the study area has experienced a steady growth in population over the last several decades. Data from the 1980 Census show a population of 135,406 for the St. Tammany Parish-Hancock County area, an increase of 156 percent since 1950. St. Tammany Parish, a suburb of New Orleans, has exhibited a stronger rate of growth than has predominantly rural Hancock County. The population of St. Tammany Parish increased by 47,284 persons (74 percent) from 1970 to 1980, whereas the population of Hancock county increased by 7,150 persons or 41 percent. In actuality, the population of St. Tammany Parish increased 430 percent over the past 50 years with more than half of this increase occurring in the last decade.

TABLE 1

HISTORICAL POPULATION STATISTICS FOR THE STUDY AREA BY COUNTY, PARISH, AND CITY OF SLIDELL

1950-1980
BY DECADE

Year	Study Area		Hancock County		St. Tammany Parish		Slidell	
	Population	Percent Increase	Population	Percent Increase	Population	Percent Increase	Population	As Percent of Parish
1950	38,879		11,891		26,988		3,464	12.9
1960	52,982	36	14,339	21	38,643	43	6,356	16.5
1970	80,972	53	17,387	21	63,585	65	16,101	25.4
1980	135,406	67	24,537	41	110,869	74	26,718	24.1

SOURCE: County and City Data Book; Bureau of the Census, U. S. Census of Population, U. S. Department of Commerce; Economic Base Study--Slidell, Louisiana-Pearlington, Mississippi, Vicksburg District, Corps of Engineers.

5. Slidell, the only large urban center in the study area, experienced an 851 percent increase in population over the 50-year period. A large portion of this increase was due to the outmigration from rural to urban areas, a pattern which occurred throughout the United States during the 1950's and 1960's. Historical trends reveal that Slidell has increased its share of the parish population from 12.2 percent in 1940 to 16.5 percent in 1960 to 24.1 percent in 1980. In the last decade, Slidell's population increased from 16,101 to 26,718, an increase of 66 percent from 1970 to 1980. The majority of this growth can be attributed to the growth of the New Orleans Metropolitan area, in which Slidell was included in the 1980 Census. Consequently, Slidell and the immediate area are experiencing growth at a rate substantially higher than the national average.

MIGRATION

6. For the last several decades, the study area has experienced a positive migration rate. As presented in Table 2, inmigration to the Slidell-Pearlington area steadily increased from 1950 to 1970; however, although remaining positive, the rate of increase dropped both in Hancock County and St. Tammany Parish from 1970 to 1975. These patterns are used as one of the main determinants in determining future population trends in the area.

TABLE 2
NET MIGRATION RATES
HANCOCK COUNTY AND ST. TAMMANY PARISH
BY TIME PERIODS FROM 1950-1975

Area	Net Migration (%)		
	1950-1960	1960-1970	1970-1975
Hancock County, Mississippi	+4.1	+12.9	+1.2
St. Tammany Parish, Louisiana	+22.1	+46.3	+15.2

SOURCE: County and City Data Book.

POPULATION PROJECTIONS

7. Projections for this analysis were obtained from data contained in the report, *Economic Base Study, Slidell, Louisiana-Pearlington, Mississippi*, prepared by the Vicksburg District, Corps of Engineers. These projections, based on OBERS forecasts, are used to represent the expected future growth trends of Hancock County and St. Tammany Parish. Projections are based on extensions of

past trends, adjusted where necessary to reflect the changing national/regional economy, and inter- and intra-agency population migrations. Projection methodologies are designed to provide reliability for the short term; for periods beyond the year 2000, growth trends are extrapolations conditioned by national trends.

8. Population projections for the study area for the years 1980 to 2040 are presented in Table 3. Population in St. Tammany Parish is expected to increase from 110,869 in 1980 to 325,338 by 2040. This increase amounts to an average annual growth rate of 3.2 percent. The population of Hancock County is projected to reach 69,010 by the year 2040, exhibiting an average annual growth rate of 3.1 percent.

TABLE 3
PROJECTED POPULATION AND DENSITY
HANCOCK COUNTY AND ST. TAMMANY PARISH
1980-2040
BY DECADE

Year	Hancock County		St. Tammany Parish	
	Population	Density	Population	Density
1980	24,537	50.9	110,869	125.0
1990	32,877	68.2	143,750	162.1
2000	42,068	87.3	180,761	203.8
2010	53,153	110.3	214,827	242.2
2020	57,986	120.3	246,701	278.1
2030	63,258	131.2	283,304	319.4
2040	69,010	143.2	325,338	366.8

SOURCE: *Economic Base Study, Slidell, Louisiana-Pearlington, Mississippi*, Vicksburg District, Corps of Engineers.

DENSITY

9. Population density for the study area averaged about 98.9 persons per square mile in 1980. Density of Hancock County and St. Tammany Parish was estimated to be 50.9 and 125.0 persons per square mile, respectively. Density for St. Tammany Parish alone increased over 311 percent from the 1950 density of 30.4 persons per square mile. The 1980 density of St. Tammany Parish is well above the 1980 State of Louisiana density of 93.6 persons per square mile. Based on the population projections presented in Table 3, population density will continue to increase throughout the study period and by 2040 will have increased to 366.8 persons per square mile in St. Tammany Parish, an increase of 194 percent. Population density in Hancock County is also expecting a substantial increase of 143.2 persons per square mile by 2040 or 181 percent.

EXISTING AND PROJECTED ECONOMIC CONDITIONS

10. From the discussion of demographics, it is apparent that the Slidell-Pearlington area is undergoing change. In many ways, the changes parallel the nation as a whole. This includes changes from rural to urban and suburban life, along with the shift of population concentration to the urban centers. Like the nation, there has been an aging of the population, but unlike the nation, there has also been a decline in the nonwhite proportion of the population. There has also been a significant growth in the housing stock. Paralleling these demographic changes have been changes in economic characteristics including employment, income, and levels of business activity.

LABOR FORCE AND EMPLOYMENT

11. The working-age population of an area is a subset of the total population and consists of those persons who are 14 years of age and older. Those persons in the working-age population who are not in the military and who are either employed or unemployed are defined as the civilian labor force. Labor force statistics for the study area, Hancock County, and St. Tammany Parish for the years 1975 to 1978 are presented in Table 4. These data, average annual figures developed by the Bureau of Labor Statistics for the given years, reflect positive employment opportunities in the Slidell-Pearlington area. The total labor force in the study area grew from 37,585 in 1975 to 42,659 in 1978, an increase of 14 percent. During this same period, employment in the study area rose 15 percent, while employment in St. Tammany Parish and Hancock County increased by 16 and 11 percent, respectively. However, it should be noted that due to the proximity of New Orleans and employment opportunities in other nearby cities, a significant number of the employed labor force work outside the county/parish boundaries.

12. According to figures published by the St. Tammany Department of Development, more than 60 percent of the work force of St. Tammany were commuting out of the parish by the end of 1982. A breakdown between the number of workers residing in the parish and residents working in other parishes/counties is presented in Table 5. According to the Bureau of Economic Analysis, there were 45,005 total workers residing in St. Tammany Parish in 1979; however, the total employment in the parish was 24,640 workers with 20,365 residents working in other parishes/counties. This analysis supports the commuter living, suburban characteristic of St. Tammany Parish which has attracted the significant inmigration contributing to the population growth over the last decade.

TABLE 4
AVERAGE ANNUAL LABOR FORCE STATISTICS FOR THE STUDY AREA, HANCOCK COUNTY, AND ST. TAMMANY PARISH
(1975-1978)

Year	Study Area			Hancock County			St. Tammany Parish		
	Labor Force	Employment	Unemployment Rate (%)	Labor Force	Employment	Unemployment Rate (%)	Labor Force	Employment	Unemployment Rate (%)
1975	37,585	34,550	8.1	6,717	6,057	9.8	30,868	28,493	7.7
1976	39,434	36,254	8.1	6,920	6,278	9.3	32,514	29,976	7.8
1977	42,987	39,165	8.9	7,303	6,519	10.7	35,684	32,646	8.5
1978	42,659	34,720	6.9	7,261	6,748	7.1	35,398	32,972	6.9

SOURCE: Bureau of Labor Statistics.

TABLE 5
EMPLOYMENT BY RESIDENCE AND PLACE OF WORK
ST. TAMMANY PARISH
(1975-1979)

Year	Total Employment in Parish	Residents Working in Other Parishes/Counties	Total Workers Residing in Parish
1975	19,062	12,740	31,802
1976	20,318	14,031	34,349
1977	21,286	17,011	38,297
1978	23,060	19,080	42,140
1979	24,640	20,365	45,005

SOURCE: Bureau of Economic Analysis; St. Tammany Parish Department of Development, Regional Economics Information System Analysis, Louisiana Tech University.

13. The total employment within the study area represents the number of wage and salary employees and the number of proprietors in Hancock County and St. Tammany Parish. Total employment statistics including employment by type and broad industrial sources are presented in Table 6. The major source of employment in the Slidell-Pearlington area is government. In particular, Hancock County's economy is largely influenced by the National Space Technology Laboratories (NSTL) Mississippi Test Facility. At its peak employment level in 1965, the National Aeronautics Space Laboratory (NASL) had 6,168 people working--principally on the Apollo Program. In 1976 this figure dwindled to about 2,500. Due to efforts by local, state, and Federal governments to obtain new uses for the facility, approximately 3,800 people were employed in 1981. Overall, in 1978 government employment accounted for 22 percent of the total with the services industry and trade (retail and wholesale) trailing close behind with 20 and 18 percent, respectively.

TABLE 6
TOTAL EMPLOYMENT STATISTICS
BY TYPE AND BROAD INDUSTRIAL SOURCES
HANCOCK COUNTY AND ST. TAMMANY PARISH
(1975-1978)

Item	Year			
	1975	1976	1977	1978
Total Employment	24,379	26,079	27,335	29,959
Number of Proprietors	3,438	3,545	3,779	3,913
Wage and Salary Employment	20,941	22,534	23,556	26,046
Farm	365	406	345	339
Nonfarm	20,576	22,128	23,211	25,707
Private	14,650	16,014	16,981	18,992
Manufacturing	2,214	2,324	2,535	2,903
Mining	131	154	182	254
Contract Construction	1,451	1,398	1,266	1,785
Transportation and Public Utilities	902	911	949	1,029
Wholesale and Retail Trade	4,264	4,738	4,957	5,495
Finance, Insurance, and Real Estate	828	998	1,004	1,262
Services	4,776	5,241	5,814	5,984
Other	84	76	81	107
Government	5,926	6,114	6,230	6,715

SOURCE: Bureau of Economic Analysis.

14. Unemployment in the study area did not change significantly between 1975 and 1978. Table 4 shows a 1.2 percent decline in the unemployment rate from 1975 to 1978. However, this is largely due to a reduction in the labor force rather than a marked increase in employment.

EMPLOYMENT PROJECTIONS

15. Employment projections for Hancock County and St. Tammany Parish from 1980 to 2040 were developed in the Economic Base Study, Slidell, Louisiana-Pearlington, Mississippi. These data are presented in Table 7. However, the true pattern of growth will be determined by the ability of the area to attract industry and the continuation of Slidell's function as a bedroom community to the greater New Orleans metropolitan area.

TABLE 7
PROJECTED EMPLOYMENT BY RESIDENCE FOR THE STUDY AREA HANCOCK COUNTY AND ST. TAMMANY PARISH 1980-2040 BY DECADES

Year	Employment by Residence		
	Study Area	Hancock County	St. Tammany Parish
1980	42,450	6,450	36,000
1990	55,356	8,632	46,724
2000	69,799	11,045	58,754
2010	83,783	13,956	69,827
2020	95,412	15,225	80,187
2030	108,693	16,609	92,084
2040	123,865	18,119	105,746

SOURCE: Economic Base Study, Slidell, Louisiana-Pearlington, Mississippi, Vicksburg District, Corps of Engineers.

INCOME

16. Total personal income, the principal component of gross national product, is an excellent indicator of economic activity within an area. It includes income of individuals received through wages, salaries, profits, property income, or transfer payments. Expressed in constant 1972 dollars, the 1980 total personal income of the Slidell-Pearlington study area was $599.0 million. This reflects an average annual increase of 14.2 percent over the $247.5 million income of 1970 (Table 8). The total personal income of Hancock County and St. Tammany Parish were $77.9 and $521.0 million, respectively, in 1980.

17. Projections of income, presented in Table 8, are based on OBERS Series E per capita income (PCI) projections and the population projections previously discussed. Personal income in the study area is projected to increase to $7,287.5 million in 2040, which reflects an average annual increase of 18.7 percent since 1980.

18. PCI is a measure of the relative support the economy provides for the population. During the 1970-1980 period, PCI in the study area increased from $3,058 to $4,424 or 4.4 percent annually (Table 8). PCI in St. Tammany Parish in 1980 ($4,700) was slightly higher than that in the study area, while Hancock County's PCI ($3,177) was significantly lower. This trend is expected

TABLE 8
HISTORICAL AND PROJECTED PERSONAL INCOME DATA
FOR THE STUDY AREA, HANCOCK COUNTY, AND ST. TAMMANY PARISH
(1972 DOLLARS)

Year	Study Area		Hancock County		St. Tammany Parish	
	Total Personal Income	Per Capita Income	Total Personal Income	Per Capita Income	Total Personal Income	Per Capita Income
	($000,000)	($)	($000,000)	($)	($000,000)	($)
1965	175.5	2,659	38.5	2,663	137.0	2,654
1970	247.5	3,058	48.3	2,779	199.2	3,133
1975	343.2	3,470	53.1	2,658	290.1	3,676
1980	599.0	4,424	77.9	3,177	521.0	4,700
1990	974.4	5,517	113.6	3,457	860.7	5,988
2000	1,553.4	6,972	177.0	4,209	1,376.3	7,615
2010	2,362.6	8,716	261.0	4,910	2,101.7	9,783
2020	3,436.5	11,279	349.2	6,022	3,087.3	12,515
2030	5,002.5	14,435	467.2	7,386	4,535.3	16,009
2040	7,287.5	18,480	625.1	9,058	6,662.4	20,479

SOURCE: Bureau of Economic Analysis.

to continue. PCI in the study area, as well as in St. Tammany Parish and Hancock County, is projected to increase throughout the period of study. PCI in the Slidell-Pearlington area is expected to reach $18,480 by 2040, an average annual increase of 5.3 percent.

VALUE ADDED BY MANUFACTURE

19. Value added by manufacture can be defined as the value of shipments and other receipts less the total cost of materials, adjusted to reflect the net change in finished products and work-in-process inventories between the beginning and end of year. Value added by manufacturing is a valuable means to measure the contribution of productive effort by industrial classification and locality. Historical and projected manufacturing statistics for the Slidell-Pearlington area are presented in Table 9. In 1980 the value added by manufacture in the study area was estimated to be $37.3 million as compared to $28.8 million in 1972. Based on manufacturing projections, value added by manufacture will reach $97.7 million for the study area by the year 2040, indicating a substantial growth in the manufacturing segment of the economy in St. Tammany Parish and Hancock County.

TABLE 9
MANUFACTURING STATISTICS FOR THE STUDY AREA,
HANCOCK COUNTY, AND ST. TAMMANY PARISH
($000 1972 DOLLARS)

Year	Value Added by Manufacturing		
	Study Area	Hancock County	St. Tammany Parish
1958	11,342	112	11,230
1963	15,119	505	14,614
1967	--	--	18,651
1972	28,800	7,400	21,400
1980	37,266	9,576	27,690
1990	47,329	12,161	35,168
2000	57,397	14,751	42,646
2010	67,472	17,348	50,124
2020	77,551	19,950	57,601
2030	87,622	22,543	65,079
2040	97,693	25,136	72,557

WHOLESALE AND RETAIL TRADE

20. Wholesale trade is defined as the sale of merchandise by establishments with one or more paid employees, primarily engaged in selling merchandise to retailers, institutional, industrial, commercial, and professional users, or

other wholesalers, or in negotiating as agents in buying merchandise for or selling merchandise to such persons or companies. As indicated in Table 10, wholesale trade in the study area increased form $26.1 million in 1967 to $42.0 million in 1972. These values reflect a 61 percent increase. Wholesale trade in Hancock County and St. Tammany Parish increased 10 and 69 percent, respectively, during the same time period. Projections show that wholesale trade will continue to flourish in the Slidell-Pearlington area throughout the period of study.

21. Retail sales are defined as the total of merchandise sold plus receipts from repairs and other services to customers and are an indication of the business activity in the area. Retail sales for St. Tammany Parish and Hancock County increased from $104.0 million in 1967 to $145.6 million in 1972 or 40 percent. Retail and wholesale sales in the area have steadily increased since 1958 and projections indicate a continuation of this trend to the year 2040 (Table 10).

OTHER ECONOMIC INDICATORS

22. The following is a brief discussion of housing and transportation in the Slidell-Pearlington study area.

HOUSING

23. Housing characteristics for St. Tammany Parish and Hancock County are presented in Table 11. The number of housing units in the Slidell-Pearlington area was estimated to be 52,304 in 1980, 40,684 of which were located in St. Tammany Parish. Data from the 1980 Census of population and housing indicate Hancock County and St. Tammany Parish to have 8,182 and 35,695 occupied units, respectively. The median value of owner-occupied units ranged from $40,455 in Hancock County to $64,149 in St. Tammany Parish in 1980, while the median rent by renter-occupied units was $151 to $198, respectively. These data reflect significant increases over 1970 values. Under existing conditions, value and rent are expected to increase as increased demands for housing are placed on urban areas.

TABLE 10
WHOLESALE AND RETAIL TRADE FOR THE STUDY AREA, HANCOCK COUNTY, AND ST. TAMMANY PARISH
(MILLIONS OF 1972 DOLLARS)

Year	Study Area		Hancock County		St. Tammany Parish	
	Wholesale Trade	Retail Trade	Wholesale Trade	Retail Trade	Wholesale Trade	Retail Trade
1958	18.161	50.097	7.192	11.358	10.969	38.739
1963	21.784	72.544	5.758	14.601	16.026	57.943
1967	26.058	104.029	3.624	18.962	22.434	85.067
1972	42.025	145.575	4.025	26.523	38.000	119.052
1980	55.049	196.549	4.602	34.117	50.447	162.432
1990	74.862	265.542	5.355	44.955	69.507	220.587
2000	94.674	334.534	6.108	55.793	88.566	278.741
2010	114.487	403.476	6.861	66.630	107.626	336.846
2020	134.300	472.519	7.614	77.468	126.686	395.051
2030	154.111	541.511	8.366	88.306	145.745	453.205
2040	173.924	610.503	9.119	99.143	164.805	511.360

TABLE 11
HOUSING CHARACTERISTICS
HANCOCK COUNTY AND ST. TAMMANY PARISH
1970 AND 1980

Characteristics	Hancock County		St. Tammany Parish	
	1970	1980	1970	1980
Number of Units	7,196	11,620	21,261	40,684
Occupied	5,152	8,182	17,834	35,695
Owner-Occupied	3,802	6,543	13,215	28,312
Renter-Occupied	1,350	1,639	4,619	7,383
Median Value of Owner-Occupied Units ($)	12,129	40,455	16,007	64,149
Median Rent of Renter-Occupied Units ($)	88	151	85	198
Median Rooms Per Unit	4.8	--	3.51	3.06
Average Persons Per Occupied Unit	3.3	--	5.0	--

SOURCE: U. S. Census of Population and Housing, Bureau of the Census, U. S. Department of Commerce; Bureau of Economic Analysis.

TRANSPORTATION

24. The overall transportation system of the study area (highways, airports, ports and waterways, and railroads) is discussed in the following paragraphs. The existing highway system permits direct access throughout the area and, therefore, has the most significant impact on growth. Other modes of transportation are limited to specific terminal locations and, in some cases, lack direct access to the interstate highway system.

Highways

25. In general, the highway system appears to adequately meet the present needs of the area. Interstates 10, 12, and 59 serve as major corridors for interregional commerce movement throughout the area. This is possibly the only area in the United States where three interstates intersect. U. S. Highways 11, 90, and 190, as well as numerous state highways, complete the system.

Air Transportation

26. The New Orleans International Airport is the largest and most dominant airport in the region. While not located in the study area, it is in close proximity. Because of its national and international flight service, it is

definitely an asset to the residents of the area. In addition to the New Orleans International Airport, the Gulfport-Biloxi Regional Airport provides daily commercial flights. The newly completed Stennis International Airport, located in Hancock County, has an adjacent industrial park and was designed with international air transportation in mind. Also, there are three small general aviation fields located in St. Tammany Parish.

Ports

27. The only commercial port in the area is Port Bienville which is located 2 miles southeast of Pearlington. It has 2,400 acres, of which 1,450 acres are divided into industrial sites and 250 acres are reserved for public-use facilities. The development includes 4,400 feet of 16-foot barge channels with a bottom width of 200 feet and 20.800 feet of 12-foot barge channels with 150-foot bottom width. The port site connects with US 90 via a 3-mile access road. It is 16 miles from Interstate 10 and 18 miles from the intersection of Interstates 10 and 59 in Slidell.

28. The NSTL, located north of Pearlington, has a port and canal system within its facility. Designed to transport the huge Saturn V rockets to and from the testing facilities, the canal system is 7.5 miles long and 110 feet wide.

Waterways

29. St. Tammany Parish and Hancock County are interspersed by waterways. St. Tammany Parish is drained by the Tchefunte River in the west, Bayou Liberty and Bayou Boufouca in the central portion, and the Pearl River in the east. Both the Tchefunte River and Bayou Boufouca flow into Lake Pontchartrain.

Railroads

30. Rail transportation is provided by three systems in the area--Seaboard System Railroad, Southern, and Illinois Central Gulf (ICG).

31. Seaboard System Railroad (formerly Louisville and Nashville Railroad) provides freight service to Port Bienville, Bay St. Louis, and Waveland in Hancock County, Mississippi. Specifically, the line runs from Pascagoula, Mississippi, to New Orleans, Louisiana, and connects with the track to Hattiesburg, Mississipi, at Gulfport, Mississippi.

32. Southern Railroad provides passenger and freight service. The passenger service runs daily from New Orleans through Slidell, Louisiana; Birmingham, Alabama; Atlanta, Georgia; to New York. Long distance freight service is also provided from New Orleans to Washington, D. C., via 4 or 5 daily runs. Local freight service runs about 3 times per week from Slidell, Louisiana, to Hattiesburg, Mississippi.

33. ICG has two lines in St. Tammany Parish, Louisiana (Louisiana Shoreline District). One runs from Slidell to Covington and provides freight service around Lake Pontchartrain, particularly to Mandeville, Louisiana. The other ICG line runs north from Slidell through Bogalusa, Louisiana, and terminates north of Monticello, Mississippi, at Wanilla. It primarily provides freight service to the St. Regis Paper Company. ICG also provides passenger service on a daily AMTRAK run from New Orleans to Union Station in Chicago, Illinois.

ATTACHMENT 2
APPENDIX B
EVALUATION OF NONSTRUCTURAL PLANS FOR FUTURE STRUCTURES

1. The Board of Engineers for Rivers and Harbors considered the report on flood control improvements for Slidell, Louisiana, at the Board meeting held 5 Mar 86. The Board requested that an additional study be undertaken to evaluate nonstructural plans involving raising of future development above the 200-year and Standard Project Flood levels. The results of this additional analysis and a comparison of nonstructural plans to the recommended plan are presented in Table 1. It should be noted that the nonstructural plans were evaluated using a base year of 1986 (i.e., rather than 1992 which was used for the recommended plan) because the nonstructural plans could be implemented immediately with the adoption of a local ordinance. Also by using a base year of 1986, excess benefits for the nonstructural plans are maximized.

2. In reviewing data presented in Table 1, it is apparent that the recommended plan is the best plan for the Slidell area. The recommended plan is the NED plan and prevents approximately 96 percent of the flood and flood-related damages whereas the nonstructural plans only prevent 12 to 21 percent of these damages.

TABLE 1

SLIDELL, LOUISIANA

COMPARISON OF COSTS AND BENEFITS FOR THE RECOMMENDED PLAN AND NONSTRUCTURAL PLANS FOR FUTURE STRUCTURES

($000)

Item	Recommended Plan			Nonstructural Plans for Future Structures a/					
				200-Year			SPF		
	Plan A	Plan E	Total	Plan A Area	Plan E Area	Total	Plan A Area	Plan E Area	Total
First Cost	7,116	13,556	20,672	1,255	2,987	4,242	1,653	4,008	5,661
Annual Cost	752	1,444	2,196	60	146	206	79	196	275
Annual Benefits	933	2,547	3,480	97	210	307	87	160	247
Excess Benefits	181	1,103	1,284	37	64	101	8	-36	-28
Benefit-Cost Ratio	1.2	1.8	1.6	1.6	1.4	1.5	1.1	0.8	0.9
Average Annual Residual Damages b/	28	128	156	579	1,785	2,364	492	1,625	2,117
Damages Prevented(%) c/	97	95	96	15	11	12	28	19	21

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a/ Costs and benefits for nonstructural plans are incremental (i.e., 200-year nonstructural plan represents the incremental cost and benefits for elevating future structures from the 100-year to the 200-year flood elevation, and the SPF nonstructural plan represents the incremental costs and benefits for elevating future structures from the 200-year to the SPF flood elevation).

b/ Residual damages are not incremental. They reflect remaining damages that would occur to existing and future structures, roads and bridges, emergency costs, etc., that would continue to occur without implementation of the recommended levee plan.

c/ Damages prevented represent percent of total damages that would be prevented with flood damage reduction measures in place.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX C
HYDROLOGY AND HYDRAULICS

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SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX C
HYDROLOGY AND HYDRAULICS

DESCRIPTION OF STUDY AREA

GENERAL

1. The Pearl River originates in Neshoba County, Mississippi, and flows some 415 miles in a southerly direction to Lake Borgne. The Basin drains a large portion of Mississippi and part of southeastern Louisiana. The drainage area of the Pearl River Basin at the mouth is about 8,760 square miles.

2. The project study area is located in the southern part of the Basin, extending from approximately U. S. Highway 90 (US 90) upstream to about 3 miles above Interstate Highway 59 (I-59). Detailed studies were limited for the most part to the West Pearl River and portions of the East Pearl River in the vicinity of the Pearlington, Mississippi, community.

3. Tributary streams within the Slidell, Louisiana, area which were included in the interior drainage portion of the study include Doubloon Branch, French Branch, Gum Bayou and Gum Creek. The total interior drainage area is about 34 square miles with ground elevation ranging from near sea level to about 35 feet, National Geodetic Vertical Datum (NGVD).

CLIMATOLOGY

4. The climate of the Slidell area is generally mild and humid. Summers are long and hot providing a long growing season; winters are usually short and moderate. The median temperature for the area is 67 degrees F. Average monthly temperatures range from about 53 degrees F in January to about 82 degrees F in July.

WATER QUALITY

5. The project area comprises two urban areas of Slidell, Louisiana, and Pearlington, Mississippi, and a large portion of the Pearl River Wildlife Management Area (WMA), a total of approximately 65,000 acres. The recommended plan for the project consists of levee and/or floodwall construction and installation of floodgates and pumping stations.

6. Dissolved oxygen (DO) concentrations are an important gage of existing water quality. DO concentrations near the project vicinity exceed EPA criteria. The DO concentration recorded over a 5-year period of record is 7.3 mg/l, with a maximum of 12.1 mg/l. Turbidity concentrations recorded during the same period of record indicate an average of 27.4 JTU's and a maximum of 72.0 JTU's. Fecal coliforms recorded an average of 195 per 100 ml and a maximum of 2,400 per 100 ml.

7. Common pollutants such as the trace metals and pesticides recorded very low levels or at levels that were nondetectable by current methods of analysis.

PRECIPITATION

8. The Slidell-Pearlington study area lies in a moderate to heavy rainfall belt with an average annual rainfall total of about 63 inches. Rainfall amounts recorded at the Slidell, Louisiana, rainfall-gaging station since 1906 range from 34.0 inches in 1962 to 84.1 inches in 1961.

INFILTRATION AND RUNOFF

9. Insufficient streamflow data are available on the tributary streams within the study area to determine runoff coefficients and infiltration rates. Runoff coefficients used in the study are estimated based on previous similar studies within the Vicksburg District. The generalized seasonal runoff coefficients used in the study are shown in Table C-1.

TABLE C-1
GENERALIZED SEASONAL RUNOFF COEFFICIENTS

Month	Runoff Coefficient
January	0.6
February	0.7
March	0.7
April	0.7
May	0.6
June	0.4
July	0.3
August	0.2
September	0.3
October	0.3
November	0.4
December	0.6

MAJOR FLOODS

10. Headwater flooding in the study area is generally confined to the winter and spring months and may result from a single storm or a series of storms lasting several days. Portions of the study area are also subject to flooding from abnormally high tides and hurricanes or less intense tropical storms. Some examples of headwater flooding since 1961 follow.

17-25 February 1961

11. Flooding occurred as a result of a complex storm system over an 8-day period. Heaviest rainfall for the period in the Pearl River Basin was 19.35 inches, which occurred at Columbia, Mississippi. Peak stage at the Pearl River, Louisiana, gage was 18.2 feet on 24 February.

5-18 December 1961

12. Moderate but steady rain over a 6-day period followed by a more intense storm caused extensive flooding throughout the Pearl River Basin. Heaviest rainfall for the 14-day period was 19.31 inches recorded at Poplarville, Mississippi. Peak stage at Pearl River, Louisiana, was 17.3 feet on 23 December.

21-24 April 1979

13. Large amounts of rainfall fell in the upper part of the Pearl River Basin with 19.6 inches being recorded at Louisville, Mississippi. Much lesser amounts of rainfall were recorded in the lower part of the Basin with only 0.2 inch at Columbia and Picayune, Mississippi. Average rainfall over the Basin was about 5 inches for the 2- to 3-day period. The storm produced a peak stage of 43.3 feet at the Jackson, Mississippi, gage, the highest recorded during the period of record from 1901 to 1983. The peak stage at Pearl River, Louisiana, was 19.3 feet on 26 April.

2 April 1980

14. Rainfall amounts were fairly uniformly distributed over the Pearl River Basin during this 5-day event. Rainfall amount for the period ranged from 8.6 inches at Franklinton, Louisiana, to 15.1 inches at McComb, Mississippi. The magnitude of the peak stage (19.8 feet at the Pearl River, Louisiana, gage) in the Pearl River-Slidell area was augmented by the fact that the Pearl River and Bogue Chitto River peaked almost simultaneously at their confluence.

2-8 April 1983

15. The lower Pearl River Basin was hardest hit by the April 1983 flood. Rainfall for the month of April was above normal over the entire Basin ranging from 169 percent above normal at Edinburg, Mississippi, to 380 percent above

normal at Columbia, Mississippi. Rainfall recorded at Columbia, Mississippi, during the period 2-8 April was 18.3 inches. Peak stage at the Pearl River, Louisiana, gage was 21.2 feet on 9 April 1983.

HURRICANES

16. Portions of the study area located south of and within 2-3 miles north of US 90 are subject to flooding as a result of hurricane storm surge and the associated intense rainfall. High stages from hurricanes have occurred within the study area several times since the 1800's. Two of the most significant storms of recent years were Hurricane Betsy (1965) and Hurricane Camille (1969). Hurricane storm surge elevations used in this study are taken from the Hancock County, Mississippi, and St. Tammany Parish, Louisiana, flood insurance studies (1984) and the Type 5 flood insurance study of the Louisiana Gulf Coast (1970). The storm surge elevations and methodology used are discussed in later sections of this appendix.

EXISTING CONDITIONS

COMPLETED AND AUTHORIZED WORKS

17. Construction was completed in 1956 on the Pearl River Navigation Project. This project provides a navigation channel from the mouth of the West Pearl River to the vicinity of Bogalusa, Louisiana, a distance of about 58 miles. The 7-foot-deep channel has a bottom width of 100 feet in the river sections and 80 feet in the canal section upstream of the locks. Three locks control water levels in the canal sections. Commercial navigation has declined to the extent that maintenance of the channel is no longer justified. The last maintenance dredging was in 1973.

18. The East Pearl River Navigation Project, completed in 1911, provides a navigation channel 9 feet deep, 200 feet wide, and about 1.3 miles long at the mouth of the river. This project experiences some commercial traffic and is maintained on an irregular basis. The East Pearl River accommodates commercial traffic upstream as far as the NASA Mississippi Test Facility. Neither the East Pearl nor West Pearl River Navigation Projects have any significant impact on the flooding in the Slidell-Pearlington area.

19. Several local levees and floodwalls exist within the study area. Field reconnaissances made throughout the study period have indicated an increasing number of private floodwalls and levees surrounding single dwellings.

HIGHWAY CROSSINGS

20. I-59, I-10, and US 90 cross the Pearl River Basin within the Slidell-Pearlington study area. The effects of these crossings on Pearl River stages during the 1979 and 1983 flood events are currently under study as discussed in the following paragraph. To the extent possible, the results of these studies are incorporated into the Slidell-Pearlington study.

21. The U. S. Geological Survey (USGS), in cooperation with the Louisiana Department of Transportation and Development (LDOT), and the U. S. Department of Transportation developed a two-dimensional finite-element surface-water flow modeling system to study the effect of the I-10 highway embankment and bridge openings on water surface elevations and flow distribution during the flood of 2 April 1980. [1/] Additional model studies are ongoing or proposed which address the effect of US 90 on the 1980 and 1983 flood events and the effect of I-10 on the 1983 event. Possible mitigation measures which would improve and/or enlarge the existing bridge openings are also being investigated as a part of the two-dimensional model studies being conducted by USGS.

BASIS OF DESIGN

DESIGN CRITERIA

Interior Drainage

22. Surface runoff and drainage within the study area are through existing and natural drainage ditches and storm sewers. No attempt was made to analyze existing drainage facilities except as required to develop runoff hydrographs. Interior drainage was considered adequate for purposes of this study.

Drainage Structures

23. Major gravity structures are designed to pass runoff from a storm of 50-year frequency with minimum flood damage in the area. Minor floodgates and/or landside drainage ditches are provided as needed to eliminate local ponding inside the leveed areas. Minor structures are designed to pass the peak runoff from a 10-year frequency storm. Selection of major gravity structure capacities was verified as a part of the interior drainage period of record analysis by comparing the rate of fall of the sump and river hydrographs and by computing the maximum positive head differential on the structures. The period of record included a maximum daily (24-hour) observed rainfall of 9.6 inches on 17 March 1961.

Pump Stations

24. A minimum of three pump station capacities were investigated for each structure. These capacities permit removal of 0.3 inch to 3.3 inches of runoff per 24 hours of pump operating time depending upon the area and

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[1/] USGS Water Resources Investigation Report 82-4119, "A Two-Dimensional Finite-Element Model Study of Backwater and Flow Distribution at the I-10 Crossing of the Pearl River Near Slidell, Louisiana," Jonathan K. Lee, David C. Froehlich, J. J. Gilbert & Gregg J. Wiche, 1983.

capacity in question. In most areas, use of the largest station capacity investigated would result in 100-year frequency sump ponding level at or below the level at which major damage begins.

25. Pump and gravity routings were performed for each alternative plan (except Plan J which is not a closed levee system) considered using 4-hour routing intervals for the period 1956-1983. Frequency curves for each of the various plans were developed using the routing results. These frequency curves serve as the basis for economic evaluation and selection of the optimum pumping station capacity.

Levees

26. Levee design profiles were developed for the 100-year, 200-year, and Standard Project Flood (SPF) events. The net levee grade for each event includes 3 feet of freeboard above the respective frequency headwater flow line or hurricane surge elevation, whichever is higher. Wave height, wave runup, and wind setup computations were performed for the portion of the proposed levees subject to hurricane surge using methods outlined in the Shore Protection Manual, Volumes I and II (1984), and in ETL 1110-2-221 and ETL 1110-2-305. Due to the relatively large distance from the shoreline to the proposed levees and the presence of obstructions including various highway embankments, trees, and other vegetation seaward of the levee, only very slight, if any, wave action is present at the proposed levee location. For this reason, the same levee freeboard was used for both the river headwater and hurricane surge areas. Future studies will address wave runup in more detail and will be presented in the General Design Memorandum.

Rainfall-Runoff

27. To evaluate interior flooding conditions with levees in place, a period of record routing model for each levee alignment (except Plan J) was developed. The period of record was from January 1956 to May 1983. The model generated inflows to the area based on daily observed rainfall and synthetic unit hydrographs. Sump stages were generated using these inflows and tailwater conditions imposed by the West Pearl River on the floodgate structures. The modified-Puls routing method was used for all pump and gravity routings. Descriptive relationships used in the computer model are explained in the following paragraphs.

Elevation-Area-Storage Curves

28. Elevation (stage) versus area curves were developed for the area within each levee alignment from 1:24000 scale topographic quadrangle maps. Additional contour information was utilized in certain areas where availability permitted. These curves represent total area including lakes, streams and other bodies of water. Elevation-volume storage curves were derived by numerical integration of the elevation area curves. Elevation-area and elevation-storage curves are shown on Plates J-25 and 26, respectively, for Plans A, D, E, and J (Cross Gates sump).

Unit Hydrographs

29. Since the tributary streams studied in the interior drainage portion of the study are ungaged, the use of synthetic unit hydrographs was necessary. The unit hydrographs were derived using methods outlined in Technical Report No. 26, "Unit Hydrographs for Southeastern Louisiana and Southwest Mississippi," USGS, 1967. The methods outlined in the report were developed by regionalization of station data from 17 gaging stations within the southeast Louisiana and southwest Mississippi area. Derivation of synthetic unit hydrographs using the above method requires only that the Basin size, length, and mean length be known. Using these computed parameters, the unit duration and adjusted lag time can be determined. The actual synthetic unit hydrograph is then computed by applying a distribution percentage to the total unit runoff volume. Unit hydrographs for Plans A, D, E, and J (Cross Gates sump) are shown on Plate J-27.

Discharge Rating Curves

30. Sump elevation versus discharge rating curves including free outlet conditions as well as tailwater spokes were computed for each major structure. Rating curves for Plans A, D, E, and J (Cross Gates sump) are shown on Plate J-28.

Seepage

31. Seepage under the levees during high river stages was considered to contribute to the inflow to interior ponding areas. A composite seepage versus river stage relation was developed using seepage versus differential head relationships furnished by the Foundation and Materials Branch for various levee reaches. Seepage was assumed negligible on Plan G due to the relatively short length of the proposed levee. Seepage versus river stage relationships for Plans A, D, E, and J (Cross Gates sump) are shown on Plate J-29.

River Stage Relations

32. West Pearl River stages at each of the major structure locations were related to stages on the Pearl River at the Pearl River, Louisiana, gage using observed high-water profiles and limited low-water data. These stage relation curves are shown on Plate J-30 for Plans A, D, E, and J (Cross Gates sump). The Pearl River at Pearl River, Louisiana, gage location is shown on Plate J-1.

Streamflow and Stage Records

33. Daily river stages and computed discharges for the Pearl River at the Pearl River, Louisiana, gage are available for the period October 1961 through September 1970. Stages and discharge measurements are available to date since October 1970. Stage records only are available for October 1899 to September 1961. The maximum annual stages and discharges for the Pearl River at Pearl River, Louisiana, for the period 1956-1983 are shown in Table C-2.

TABLE C-2
MAXIMUM ANNUAL RIVER STAGE AND DISCHARGE

Year	Stage (ft)	Discharge (cu ft/sec)
1956	15.3	41,100
1957	15.3	41,400
1958	16.1	59,700
1959	14.6	32,500
1960	15.2	40,000
1961	18.2	125,000
1962	16.6	92,600
1963	13.0	22,500
1964	16.3	66,400
1965	16.1	59,900
1966	17.6	114,700
1967	14.5	31,100
1968	14.4	31,600
1969	15.5	45,600
1970	12.6	21,600
1971	15.5	44,800
1972	16.2	63,300
1973	16.5	87,400
1974	16.8	121,000
1975	17.1	71,000
1976	16.6	74,200
1977	17.1	89,200
1978	15.3	41,400
1979	19.3	162,000
1980	19.9	184,000
1981	15.3	42,300
1982	14.8	34,000
1983	21.2	230,000

34. River stage records only are available on the East Pearl River at Pearlington, Mississippi, for the period 1962-1984 and at Rigolets near Lake Pontchartrain (Fort Pike) for the period 1932-1984. The Rigolets stage data are shown on Table C-3. Limited discharge measurements taken during the 1979, 1980, and 1983 flood events at US 90 and I-10 highway crossings are available. The tributary streams considered in this study are ungaged.

TABLE C-3
MAXIMUM ANNUAL RIVER STAGE
RIGOLETS NEAR LAKE PONTCHARTRAIN

Year	Stage	Year	Stage
1932	3.1	1958	3.4 a/
1933	3.1	1959	3.5
1934	2.9	1960	4.0 a/
1935	2.4	1961	4.8 a/
1936	2.8	1962	2.7
1937	3.7	1963	3.4 a/
1938	3.1	1964	4.5 a/
1939	2.7	1965	7.0 a/
1940	3.6	1966	3.9
1941	3.8	1967	3.3
1942	3.0	1968	2.7
1943	4.1	1969	9.0 a/
1944	2.6	1970	3.3
1945	3.1	1971	4.2
1946	2.8	1972	3.9
1947	7.2 a/	1973	4.8
1948	4.1	1974	4.2
1949	3.8	1975	2.7
1950	4.2	1976	2.5
1951	2.7	1977	3.4
1952	3.1	1978	2.9
1953	3.7	1979	4.2 b/
1954	4.7	1980	4.0
1955	4.0	1981	2.7
1956	5.8 a/	1982	2.7
1957	4.1 a/	1983	4.7
		1984	2.9

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a/ Affected by hurricanes.
b/ Incomplete record.

Standard Project Flood

35. The SPF represents the flood that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations. Procedures recommended in EM 1110-2-1411 were used in estimating the Standard Project Storm (SPS) over the Pearl River Basin. The resulting SPS isohyetal pattern was oriented along approximately the same axis as the 2-8 April 1983 storm and the average SPS depth computed. (The 2-8 April 1983 storm produced the historical peak discharge at the Pearl River, Louisiana, gage location.) The ratio of the computed SPS average rainfall depth (16.1 inches) to the 2-8 April 1983 average rainfall depth (14.7 inches) was multiplied by the 2-8 April 1983 measured peak discharge at the Pearl River, Louisiana, gage. Estimated base flow was then added to this value to obtain the SPF peak discharge.

36. SPF sump stages were determined by computing the SPS (per EM 1110-2-141) for each sump drainage area, applying the SPS to a unit hydrograph to produce sump inflows and then routing these inflows through sump storage for each plan. Blocked gravity conditions were assumed during the entire routing period and thus outflows were limited to pump discharge capacity. Sump stages were assumed equal to the stop-pump elevation at the initial routing period.

Water Surface Profiles

37. Water surface profiles were developed on the East Pearl and West Pearl Rivers using standard step backwater computations. The computer program HEC-2 was used for the computations. Flow distribution between the East Pearl and West Pearl Rivers was estimated from discharge measurements made during 1979, 1980 and 1983 flood events. Only limited low-flow data are available within the area modeled. Because the HEC-2 computer model is limited to 1-dimensional steady state flow conditions and because stages across the Pearl River flood plain in the study area are not uniform (observed peak stages at US 90 and I-10 indicate as much as 2 feet differential in stages on the East and West Pearl Rivers), two separate models were developed. This provided adequate data as only the stages along the east and west edges of the flood plain are used in the study. The models were calibrated to the 1980 and 1983 high water profiles. Calibration profiles are shown on Plate J-31.

Highway Bridge Opening Improvements

38. During the 2-8 April 1983 flood event, the US 90 and I-10 highway crossings were closed to traffic due to river overtopping. As a result, various bridge opening improvements are being investigated by LDOT. Improvement of

the bridge openings would lessen the backwater caused by the I-10 and US 90 roadway embankments and thus lower the water surface profiles for a given event. Through coordination of the agencies involved, "target" backwater reductions were developed. These values were used to modify the water surface frequency profiles for this study.

Base Conditions

39. Base conditions are assumed equal to 1984 conditions.

Future Conditions

40. For hydrology and hydraulic purposes, future with- and without-project conditions are assumed equal to conditions immediately after construction and base conditions, respectively.

ALTERNATIVE PLANS ANALYZED

41. Eight separate levee alignments with various combinations of gravity outlets and pumps were analyzed using existing condition (1984) water surface profiles on the West Pearl River. After initial screening, the feasible levee alignments were reanalyzed using West Pearl River flow lines which reflect the assumed bridge modifications at I-10 and US 90. The alternative plans studied are discussed below and shown on Plates J-11 to J-17 and J-20. Both gravity outlets and pump stations are provided for each plan at various locations. However, it should be noted that Plan J would not require a pump station at Doubloon Bayou because this plan is an open levee system.

PLAN A

42. Plan A (Plate J-11) consists of an earthen levee beginning near Military Road in the vicinity of Ravenwood Subdivision, extending downstream generally along the bluff line of West Pearl River and connecting to high ground near I-10. A gravity outlet structure and pumping station are provided at Gum Bayou to evacuate interior runoff. Smaller floodgates and landside ditches are required to prevent localized landside ponding during low river periods.

PLAN B

43. Plan B (Plate J-12) is similar to Plan A except that Gum Bayou is left open to the West Pearl River and a ring levee is formed to protect the developed area east of I-59 between the West Pearl River and Gum Bayou. That portion of the levee extending from near Ravenwood Subdivision downstream along the West Pearl River to just north of Gum Bayou is the same as the Plan A alignment.

PLAN C

44. Plan C (Plate J-13) consists of a relatively short levee connecting high ground near Devil's Elbow with Military Road south of the Cross Gates Subdivision. Only the Cross Gates and River Crest areas are protected by this levee. A single floodgate and pump station are required.

PLAN D

45. Plan D (Plate J-14) provides the most comprehensive protection of any plan analyzed to the area south of I-10. The levee connects to high ground near I-10, extends downstream along the river to beyond Doubloon Bayou, intersects US 190 south of Belle Acres and connects back to high ground near the intersection of US 190 and I-10. The protected area is divided into two sumps with a floodgate and pump station for each sump.

PLAN E

46. Plan E (Plate J-15) provides protection similar to that of Plan D. The River Oaks/Indian Village area included in Plan D is omitted in Plan E. An undeveloped, low-lying area between Cross Gates and Quail Ridge is also omitted for environmental reasons. The remainder of the Plan E levee alignment is the same as Plan D. Floodgate structures are provided at Doubloon Bayou (both crossings) and in the vicinity of Cross Gates Subdivision.

PLAN F

47. Plan F (Plate J-16) consists of a loop levee protecting the Cobb-Hammock area. The levee connects to high ground at both ends and has a single floodgate and pumping station.

PLAN G

48. Backwater from the Pearl River floods portions of the Pearl River, Louisiana, community via Gum Creek. Plan G (Plate J-17) provides a short levee to prevent this flooding. A relatively large gravity drainage structure and pump station are required on this plan due to the large drainage area of Gum Creek and limited sump storage volume.

PLAN J

49. Plan J (Plate J-20) consists of a levee which connects to high ground near I-10 and extends downstream along the same alignment as Plan E to a point near where the Plan E levee intersects US 190 south of Belle Acres. From this point, the levee continues downstream along US 190 and connects with Highway 90 just west of the intersection of US 90 and US 190. This plan includes

a pumping station and major floodgate located in the vicinity of Cross Gates Subdivision (same facilities as Plan E) and a major floodgate on Doubloon Bayou. Plan J does not provide hurricane surge protection. This plan was added to the study following the April 1985 public meeting as specifically requested by local residents.

50. Details of the above plans including drainage areas, structure sizes, and pump capacities are shown in Table C-4.

TABLE C-4
DRAINAGE AREA, STRUCTURE SIZE, AND PUMP CAPACITIES ALL PLANS CONSIDERED

Plan	Drainage Area (ac)	Floodgate		Pump Capacities Analyzed (cfs)
		Size (ft)	Type	
A	3,770	10 x 8	Box	15 - 30 - 50 - 150 - 250
B	1,360	7 x 8	Box	25 - 60 - 100
C	360	5 x 5	Box	15 - 30 - 50
D				
Main Sump	8,200	10 x 8 [a]	Box	50 - 150 - 250 - 500 - 700
Cross Gates Sump	940	5 x 7	Box	15 - 30 - 50
E				
Main Sump	6,500	Double 7 x 8	Box	150-250-500-700-1,000
Cross Gates Sump	360	5 x 5	Box	15 - 30 - 50
F	140	Double 60-in	CMP/CPP	10 - 20 - 30
G	8,200	Double 8 x 10	Box	250 - 500 - 750
J				
Cross Gates Sump [b]	360	5 x 5	Box	15 - 30 - 50
Upper Sump (Above US 190)	5,200	Double 5 x 7	Box	N/A
Lower Sump (Below US 190)	13,350	N/A	N/A	N/A

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[a] At the request of local interests, the Vicksburg District evaluated a 56-foot-wide sector gate navigable floodgate in place of the 10- by 8-foot box floodgate.

[b] Same as Plan E, Cross Gates sump.

Design Profiles

51. The 100-year, 200-year and SPF West Pearl River design water surface profiles for Plans A, D, and E are shown on Plate J-32. These profiles do not include the required 3 feet of freeboard and must therefore be raised 3 feet to obtain the net levee grade as discussed in paragraph 26, page C-6. Hurricane surge elevations are reflected in the profiles. Design profiles for Plan J, which do not reflect hurricane surge elevation, are shown on Plate J-33.

Frequency Curves

52. Stage-frequency curves were developed for each levee plan investigated using the annual peak sump stages generated by the routing model. Sample curves on Plan A were computed using both peak sump volumes and peak sump stages. The results of the two procedures compared favorably, and therefore, peak sump stages were used in the remaining frequency computations. All curves were computed according to procedures outlined in "Statistical Methods in Hydrology," Leo R. Beard, January 1962, and Bulletin 17, Water Resources Council, "Guidelines for Determining Flood Flow Frequency." The statistical distributions employed by analytical techniques such as the Log-Pearson Type III could not be reasonably applied to the sump or backwater area. Therefore, a graphical or plotting-positions method was used. Existing condition stage-frequency curves at each major structure location were developed from the river water surface frequency profiles at that point. Frequency curves were developed for floodgate only and for various pump capacities on each plan. Curves for Plans A, D, E, and J (Cross Gates sump) are shown on Plates J-34 and J-35. A flow-frequency curve for the Pearl River at Pearl River, Louisiana, was used to develop the river frequency flows used in the study. The curve was developed by USGS from data through 1980 and was adopted by an interagency agreement among USGS, the Corps of Engineers, and the National Weather Service. The curve was recomputed using data through 1983 with only insignificant changes resulting. Therefore, the adopted curve was used. This curve is shown on Plate J-36.

53. Portions of the area protected by Plans D, E, and J are subject to flooding from both the Pearl River and from hurricane surge. Because river and hurricane flooding occurs almost exclusively in different seasons of the year, they were assumed to be independent. The procedure used in the economic analysis of Plans D, E, and J makes the assumption that the total probability of a certain level of flooding from both river and hurricane is equal to the sum of the river and hurricane flood probabilities $P(\text{total}) = P(A) + P(B)$. This procedure used the hurricane and river frequency curves separately. The statistically correct procedure would have been to combine the hurricane and river curves using the equation $P(\text{total}) = P(A) + P(B) - (P[A] \times P[B])$. However, the procedure used provides essentially the same answer as the correct procedure and the analysis was therefore not changed. Stage-frequency curves for Plan J (excluding the Cross Gates sump) are shown on Plate J-37.

Pump Operation Data

54. Results of the period of record routings were used to develop data to determine pump energy requirements. The average annual days during which pumping occurred and the average static head pumped against were computed for each pump station investigated. These data for Plans A, D, E, and J (Cross Gates sump) are tabulated in Table C-5. Start and stop pump elevations used for Plans A, D, E, and J (Cross Gates sump) are shown in Table C-6. River stage and ponding area hydrographs for the April 1983 flood for Plans A and E are shown on Plates J-38 through J-40.

TABLE C-5
PUMP OPERATION DATA

Plan	Pump Capacity (cu ft/sec)	Average Days Pumped Annually	Average Static Head (ft)
A	15	79	1.2
	30	68	1.6
	50	54	2.2
	150	29	2.4
	250	24	2.5
D (Main Sump)	50	48	1.2
	150	28	1.8
	250	17	2.3
	500	16	2.4
	700	15	2.5
D (Cross Gates Sump)	15	27	2.6
	30	18	2.8
	50	14	2.8
E (Main Sump)	150	17	1.6
	250	13	1.8
	500	10	2.2
	700	9	2.6
	1,000	9	2.7
E (Cross Gates Sump)	15	42	1.9
	30	39	2.3
	50	38	2.5
J (Cross Gates Sump) [a/]	15	42	1.9
	30	39	2.3
	50	38	2.5

[a/] Same as Plan E, Cross Gates sump.

TABLE C-6
START AND STOP PUMP ELEVATIONS

Plan	Elevations (Feet, NGVD)	
	Start Pump	Stop Pump
A	3.6	3.0
D (Main Sump)	2.0	1.0
(Cross Gates Sump)	3.8	1.0
E (Main Sump)	2.6	1.0
(Cross Gates Sump)	3.6	2.4
J (Cross Gates Sump) [a]	3.6	2.4

[a] Same as Plan E, Cross Gates sump.

Residual Flooding

55. Each of the alternative plans analyzed as part of the study provides flood protection from the West Pearl River and/or hurricane surge up to a designated level. However, the protected areas remain vulnerable to flooding which exceeds the design. This residual flooding could occur from levee overtopping due to occurrence of greater than design flow on the Pearl River, intense interior rainfall resulting in interior runoff which exceeds the design capacity of the outlet works or from greater than design hurricane surge.

56. The SPF peak sump elevations (as described in paragraph 36) were used to estimate the effect of an intense rainfall over the protected areas. Peak sump stages occur 36 to 48 hours after the beginning of the storm. SPF sump stages for various plans are shown in Table C-7.

TABLE C-7
SPF PEAK SUMP STAGES

Plan	Pump Capacity (cfs)	SPF Sump Stage (feet, NGVD)
A	Floodgate Only	12.6
	15	12.1
	30	11.0
	50 [a]	10.0
	150	9.2
	250	8.4
D (main sump)	Floodgate Only	9.2
	50	8.7
	150	8.2
	250	7.8
	500	7.4
	700	7.2
D (Cross Gates sump)	Floodgate Only	11.0
	15	8.6
	30	7.9
	50	7.3
E (main sump)	Floodgate Only	9.6
	150	8.8
	250 [a]	8.1
	500	7.5
	700	7.1
	1,000	6.8
E (Cross Gates sump)	Floodgate Only	12.2
	15 [a]	10.5
	30	9.6
	50	9.0

---

[a] Recommended plan.

57. Residual flooding resulting from levee overtopping would result in flood stages very near those which would occur without the project in place. Some localized increased velocities would exist near the point of initial overtopping until stages equalized on both sides of the levee. Approximately 2 to 3 days advance warning time would be available prior to the river crest reaching the Slidell area (based on 1983 flood event).

Effect of Levees on River Stages

58. The effect of the proposed levees on Pearl River stages was analyzed by routing the observed April 1983 flood from I-59 to US 90 using the Modified-Puls routing procedures. The area was divided into two reaches with one reach extending from I-59 to I-10 and the other reach extending from I-10 to US 90. The increase of West Pearl River stages is shown in Table C-8.

TABLE C-8
WEST PEARL RIVER STAGE INCREASE
(Feet)

Plan	I-10	US 90
A and E	Negligible	Negligible
A Only	Negligible	Negligible
E Only	N/A	Negligile
A and J	Negligible	.2-.4

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX D
GEOLOGY AND SOILS

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APPENDIX D
GEOLOGY AND SOILS

GEOLOGY

GENERAL

1. In August and September 1983, 26 borings from 50 to 100 feet in depth were drilled to determine the geology along the west bank of the Pearl River in the Slidell-Pearlington area (Plate J-41). The borings had an average spacing of approximately 1 mile and were concentrated along the six proposed levee alignments; three located north of I-10 (Plan A, Plate J-11; Plan B, Plate J-12; and Plan F, Plate J-16) and three south of I-10 (Plan C, Plate J-13; Plan D, Plate J-14; and Plan E, Plate J-15). These alignments include a series of gravity drains and pumping stations to remove water from within the leveed area.

2. At the April 1985 public meeting, local interests requested the Corps to evaluate another levee plan, referred to as Plan J, for the area south of I-10 (see Plate J-20). The upper reach of this levee alignment was the same as Plan E; however, no geology and soils analysis was conducted for the lower 1.5 miles of this levee plan.

REGIONAL GEOLOGY

Physiography

3. The Pearl River empties into the Pontchartrain Basin which is one of the northern boundaries of the Gulf of Mexico. All of these features are located in the southern part of the Mississippi Alluvial Valley which is a subprovince of the Central Gulf Coastal Plain. The study area is located just upstream of the mouth of the Pearl River (Plate J-42).

Topography

4. The Pearl River in the Slidell-Pearlington area occupies a drowned river valley which developed during recent time. This drainage system is a geologically young event that occurred after the deposition of the Citronelle Formation. The upper limit of the drowned river valley is interpreted to be at the intersection of the Bogue Chitto and Pearl Rivers. The area is basically flat and relief of more than 10 feet is rare. Surficial deposits consist of Prairie Terrace deposits (mostly between elevation 18 and 30 feet, National Geodetic Vertical Datum (NGVD)) that are topographically higher than the younger Deweyville Terrace which, when present, is generally between ele-

vation 10 and 18 feet, NGVD (Plate J-42). Toward the east is the West Pearl River Basin, which is an alluvial plain several miles wide that contains bayous, sloughs, swamps, and marsh.

Lithology - Stratigraphy

5. The proposed Slidell-Pearlington levee will be situated on Quaternary, Pleistocene, Prairie and Deweyville Terrace deposits and Holocene (Recent) alluvial sediments. These deposits consist primarily of surface clays underlain by fine to medium grained sands. Lenses of silt and heterogeneous mixtures of clays, sands, and silts are also present.

Structures

6. The major structural feature in the area is the Gulf Coast Geosyncline which created a regional dip toward the south. However, the Hancock Ridge, a deep-seated northeast-southwest trending granite ridge that is part of the Wiggins Anticline, is located about 20 miles toward the east and may affect the regional dip in this area. An east-west trending fault has also been mapped about 1 mile south of the southern end of the project.

Tectonics

7. The study area is located in Zone 1 near the dividing line between Zone 1 and Zone 0 of the seismic zone maps of the United States. Earthquakes in this vicinity should be very infrequent and of low intensity. ER 1110-2-1806 recommends that a coefficient of 0.025g be used for design purposes.

SITE GEOLOGY

General

8. Levees for this project will be constructed on Prairie or Deweyville Terrace deposits or Recent alluvium. The Prairie Terrace is the oldest of these. It generally forms a slight bluff along its east boundary which is located from 0.25 to 0.50 mile east of I-59 and slightly north of I-10. South of I-10 the Prairie Terrace bluff line forms the west boundary of the alluvial deposits. The Prairie Terrace surface is generally above elevation 18 feet, NGVD, but south of I-10 and east of I-59 it is mainly between elevation 10 and 15 feet, NGVD. An area of Deweyville Terrace is presently east of I-59 and north of I-10 and is located roughly between the eastern limit of the Prairie Terrace and the western extent of the alluvial deposits. However, a shallow, narrow strip of Recent alluvial sediments is present between the Prairie and Deweyville Terraces. The Terraces are fluvial (river) deposits that were deposited between 15,000 and 60,000 years ago and exhibit the normal fine grained topstratum, coarse grained substratum sequence developed by present day rivers. The youngest sediments in this vicinity are the Recent alluvial deposits of the West Pearl and Pearl Rivers. They are present from the bluffs formed by the Terraces and extend eastward 5 or more miles.

Plan A

9. Deweyville Terrace sediments will be the foundation for most of the levee with Recent alluvial deposits comprising the remainder. Profile D-D (Plate J-45) shows the geology of the area roughly in the vicinity of the levee location. Except for a 1- to 3-foot-thick veneer of silt or silty sand in some locations, the surface is capped by 6 to 18 feet of stiff to very stiff clay. Silt and silty sand lenses make up the remainder of the fine grain deposits which are underlain by from 25 to more than 80 feet of fine to medium grained sand that may contain some gravel and/or wood. Silt, silty sand, and clay lenses were encountered within the sand stratum. Boring SP-9-83U shown on Profile E-E (Plate J-45) depicts the conditions present at the southern end of the levee where the Prairie Terrace is present. The surface is capped by 2.5 feet of silt underlain by 4.5 feet of clayey sand which is then underlain by 11 feet of silty sand. Below this is more than 33 feet of sand that may contain some gravel. Therefore, a clay stratum is not present in the fine grained segment in this vicinity. Boring 9A, located 0.25 mile to the east, was bored near the contact between the Terrace and the alluvial valley deposits. It did reveal a 12-foot-thick section of soft clay material that contained silt lenses, wood, and rootlets.

Plan B

10. The northern and eastern segments of this plan are identical to Plan A. However, the southern portion turns westward and then traverses northward basically parallel to Gum Bayou. Profiles B-B and C-C show the geologic conditions (Plate J-44). This portion is also Deweyville Terrace sediments and the surface, except for a 1- to 3-foot-thick veneer of silt in a few locations, is capped by 6 to 18 feet of medium stiff to hard clay. This is underlain by from 17 feet to more than 60 feet of fine to medium grained sand that may contain gravel. Lenses of sandy gravel, clay, clayey sand, and silty sand were also encountered.

Plan C

11. Profiles F-F and G-G present borings in the general vicinity of this levee alignment (Plates J-46 and J-47). This area has been identified on the geologic map of Louisiana as Prairie Terrace, but the elevation of the land correlates with Deweyville Terrace sediments and Recent alluvial deposits. Except for a veneer of silt or silty sand in a few places the surface is capped by 8 to 32 feet of medium stiff to very stiff clay that may contain lenses of silty sand or sand. Beneath the fine grained sediments is fine to medium grained sand that may contain gravel. Soft clay was noted in boring SP-22-83U indicating that this location is Recent alluvial deposits.

Plan D

12. All of this levee alignment will be located on deposits identified as Prairie Terrace although, as previously stated, according to elevation they correlate better as Deweyville Terrace sediments. Profiles G-G, H-H, and I-I reveal the geologic conditions in the vicinity of the proposed levee (Plates J-47 thru J-49). Other than at borings SP-14-83U and SP-25-83U and a 1- to 3-foot-thick veneer of silt in a few locations, the surface is capped by 8 to more than 45 feet of medium stiff to very stiff clay that may contain lenses of silt, silty sand, and/or sand. This is underlain by fine to medium grained sand that may contain lenses of clay and/or silty sand. At borings SP-14-83U and SP-25-83U, the surface is capped by 2 to 3 feet of silt underlain by silty sand and sand. Below this is a stratum of medium to very stiff clay more than 33 feet thick that may contain lenses of silt, silty sand, and/or sand. Although these two borings were terminated before they encountered the thick sand stratum, it is believed to be present within the next 10 feet.

Plan E

13. This plan is basically a combination of the geologic conditions presented for Plans C and D as shown by Profiles F-F, H-H, and I-I (Plates J-46, J-48, and J-49).

Plan F

14. No detailed contour maps were available for this area so elevations shown on a quadrangle map were used. The majority of this site is Prairie Terrace deposits which will form the foundation for the levee. In some places a veneer of silt 1 foot or 2 feet thick will cover the surface, but primarily it is stiff to hard clay that is from 7 feet to 14 feet thick (Profile A-A, Plate J-43). Boring SP-16-83U indicates fine to medium grained sands underlie the surface clay and in boring SP-17-83U there is only a 4-foot-thick lense of silty sand between the surface clay and the sand stratum.

Ground Water

15. Elevations in the study area vary from about elevation 2 feet, NGVD, to approximately 22 feet, NGVD. Because of the very low flat topography of the site, the ground water will be within 1 foot to 3 feet of the ground surface in most areas and seldom more than 10 feet below ground surface.

Construction Materials

16. Concrete from local suppliers is available within a 25-mile radius. However, any riprap used in construction will have to be shipped into the area.

Engineering Considerations

17. Most of the levees will be constructed on Pleistocene Terrace deposit clays that are medium stiff to hard. These clays are consolidated and should not present settlement problems. Alluvial clays could be present in very low areas and could present settlement problems.

Conclusions

18. No geologic conditions were found that would require a negative recommendation for the proposed levee.

SOILS

SCOPE OF STUDY

19. The scope of study for the Slidell flood control project consisted of slope stability, underseepage, and settlement analyses of the proposed levee alignments. The levee alignments referred to as north of I-10 include Plans A and B; those south of I-10 include Plans C, D, and E; the Cobb-Hammock levee is Plan F.

FIELD EXPLORATION

20. Foundation exploration consisted of 26 borings made during August and September 1983. The locations of borings were based on access to the sites and the fact that this is a feasibility study which covers a large area and presents several different levee alignments to be studied. Undisturbed samples of clays and silts were taken from the foundation borings using a 5-inch I.D. vacuum-type Shelby tube sampler. All other samples were obtained using a 2.5-inch diameter drive tube. Borings are shown for all plans on Plate J-41. All borings are shown in profile on Plates J-43 through J-49. The boring legend is presented on Plate J-50. No borings were taken in the low-lying areas (i.e., Gum Bayou) because of limited access to these sites. Before a final design can be made, borings will be required in these low areas. It is believed that these areas will be the most critical for stability and settlement.

LABORATORY TESTS

21. Laboratory tests performed by the Vicksburg District Soils Laboratory consisted of visual classification of all samples, water content determination on clays and silts, unconfined compression tests on select, undisturbed clay samples, and grain size analysis on foundation sands.

SETTLEMENT ANALYSES

22. Settlement analyses were performed for the area north of I-10, south of I-10, and the Cobb-Hammock Loop Levee. The computer program WESLIB/I0016 was used to compute the vertical stress beneath the levee. These stresses were

then used to compute the amount of settlement. Levee heights throughout the project generally range from near 0 to 15 feet. Occasionally, heights may reach slightly greater than 15 feet; however, these are isolated areas. The main areas of concern were the low-lying areas in which the levee height would be 10 feet or more. The borings north of I-10 indicate a top stratum thickness averaging 8 to 12 feet and ranging in consistency from medium to hard. These borings were made in areas where the levee height would be less than 10 feet. Therefore, an assumption was made that in areas where the levee grade is greater than 10 feet (low-lying areas), there would exist at least 10 feet of soft top stratum with a high water content. It was assumed that this clay top stratum had a high water content of 60 percent and a void ratio of 0.5 to 1.0. A compression index, Cc, of 0.65 was used. This value was obtained from the relationship of w.c. versus Cc (NAVFAC DM-7). Based on these assumptions, a 2-foot overbuild would be required for the areas in which the levee height would be 10 feet or more. Borings will be needed in these low areas to better define the soil conditions and eliminate these assumptions. All other areas north of I-10 will require a 10 percent overbuild (percent overbuild based on required levee height). For the areas south of I-10 in which the levee height is 10 feet or more, a 2-foot overbuild will be required. This is based on an analysis performed using the stratification and water contents from boring SP-15-83U. All other areas south of I-10 will require a 10 percent overbuild. For the Cobb-Hammock Loop Levee, a 10 percent overbuild is required. This is based on an analysis performed using the stratification and water contents from boring SP-17-83U. For the analyses performed using borings SP-15-83U and SP-17-83U, the void ratios were obtained from the unconfined compression tests performed on the clay samples. The compression index, Cc, was obtained from the relationship of w.c. versus Cc (NACFAC DM-7).

STABILITY ANALYSES

General

23. Sliding stability analyses were performed for the areas north and south of I-10. The analyses for the levee north and south of I-10 were performed on a levee section with a height of 15 feet. The levee heights analyzed are based on the Standard Project Flood (SPF) flow line plus 3 feet of freeboard. This would be representative of the levee heights which would occur in the low-lying areas and which would present the more critical case. Side slopes for the levee were 1V on 4H landside and 1V on 3H riverside. The LMVD method of planes was used to perform the analyses for the end-of-construction case. The minimum acceptable factor of safety for the end-of-construction case is 1.3.

North of I-10

24. One analysis was performed for the area north of I-10. The strengths and stratification were based on the assumption that there exists at least 10 feet of soft clay in the low-lying areas. A value of 315 psf for this layer results in a computed safety factor of 1.304. This value seems appropriate for this type soil. This approximation was made since no borings could be taken in these low areas at this time and since it is believed that these low areas will be the critical stability areas. Also, the borings north of I-10 have an average of 8 to 12 feet of top stratum with high cohesions. Results of this analysis are presented on Plate J-51.

South of I-10

25. One analysis was performed for the area south of I-10. The strength and stratification were based on boring SP-14A-83U. This boring shows approximately 41 feet of clay top stratum with strengths ranging from 660 psf to 1,300 psf. A 15-foot levee height was used in the analysis. The critical factor of safety for this section is 2.33. Results of this analysis are presented on Plate J-51.

Levee Sections

26. Although side slopes of 1V on 4H and 1V on 3H were assumed in the analyses, it is likely that steeper side slopes will be adequate, particularly for levee heights of less than 10 feet. This can be determined more accurately with further field investigations. For the purposes of this report, a conservative assumption was used for the levee side slopes.

SEEPAGE ANALYSIS

27. Underseepage analyses were performed for the areas north of I-10, south of I-10, and the Cobb-Hammock Loop Levee. Analyses were performed for the borings located closest to the various levee alignments. The SPF flow line was used in all analyses. Generally, entrance distances were based on either remaining top stratum thicknesses assumed from nearby borings or the Pearl River, whichever resulted in the lesser distance. The method of analysis as outlined in DIVR 1110-1-400, Section 8, Part 6, Item 1, 30 November 1976, was used in the seepage analysis. The seepage analyses indicate that the areas between station 252+00 to 260+00 and station 272+00 to 287+00 of the B alignment north of I-10 would need a small landside berm 60 feet wide and 3 feet thick. This is based on the information from boring SP-3-83U. All other areas north of I-10, including the Cobb-Hammock Levee Loop, and south of I-10 would not require a seepage berm.

BORROW PITS

28. Onsite borrow pit locations were selected in such a manner as to reduce the haul distance of the borrow material as much as possible and keep to a minimum the disturbance of the residential areas. There is no boring information for the proposed borrow pits; therefore, it is not known whether the material in these borrow pits is suitable for levee construction. Seepage analyses were performed in these areas to determine if the borrow pits would affect the seepage conditions. The borrow pits listed below were chosen based on the assumption that the material is suitable for levee construction (mostly clays and silts). No investigation has been made into the offsite borrow pits, but the material is assumed to be suitable.

Plan	Station	Pit Location	Limiting Elevation and Distance from Levee Toe
A	106+00 - 112+00	L.S. & R.S.	10.0 (46′)
	142+00 - 146+00	L.S.	10.0 (46′)
	156+00 - 163+00	L.S.	10.0 (46′)
B	106+00 - 112+00	L.S. & R.S.	10.0 (46′)
	142+00 - 146+00	L.S.	10.0 (46′)
	156+00 - 163+00	L.S.	10.0 (46′)
	245+00 - 252+00	L.S. & R.S.	10.0 (46′) 8.0 (800′)
	252+00 - 260+00	No Pit Allowed	
	272+00 - 287+00	No Pit Allowed	
	314+00 - 326+00	L.S. & R.S.	80.0 (430′) 6.0 (1,580′)
D	33+00 - 46+00	L.S. & R.S.	6.0 (46′)
	137+50 - 154+00		7.0 (46′) 5.0 (1,140′)
E	343+50 - 354+50	L.S.	0 (46′)

STRUCTURE INVESTIGATIONS

29. Minor structures are located at various low places along each of the alignments. Based on the limited boring information available, it is difficult to determine the soil conditions at each of the structure sites. No site-specific ground-water information is available at each of the structures. This will be investigated during detailed design studies. Based on invert elevations which would require shallow excavation and soil stratification from the nearest boring (mostly clays), it appears that little or no dewatering will be necessary for the excavation and construction of these structures. Therefore, for this phase of the study, it was assumed that dewatering would not be necessary.

30. Major structures (concrete box culverts) investigated included the following locations: Plan A, station 235+45; Plan B, station 261+60; and Plan D, stations 65+00 and 425+00. Based on nearest boring information, it is recommended that a ring of wellpoints on 10-foot centers be used to dewater the excavations, with each well flowing 5 gpm.

FUTURE INVESTIGATIONS

31. Future investigations will be required after it is determined which levee alignments will be used. These investigations will consist of borings located along the levee at closer intervals and, in the low-lying areas, for levee and structure locations. Piezometers may need to be installed at the various structure sites and in more areas along the levee.

32. Upon more detailed field investigation of the final alignments, it may be determined that floodwalls would be a better solution in certain areas with limited rights-of-way. If this is the case, detailed borings, testing, and analyses will be performed at that time.

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APPENDIX E
COSTS

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APPENDIX E
COSTS

GENERAL

1. This appendix contains the costs for levee Plans A, D, E, and J that were carried into the final screening and evaluated in detail. Plan A was the only feasible alternative providing protection to the area north of I-10 and Plans E and J were the only feasible alternatives providing protection to the area south of I-10. However, Plan J did not provide protection from hurricane flooding.

2. Three different levels of protection--100-year, 200-year, and SPF--were evaluated for each levee plan. Numerous pump sizes and pump combinations were evaluated and economically optimized to determine the pump with the greatest excess benefits over cost. Comparison cost analyses for the various pump options considered in Plans A, D, E, and J are summarized in Tables E-1 through E-15.

3. Due to the high real estate values in the project area and local opposition to onsite borrow, the costs of using either on- or offsite borrow materials for levee embankment were investigated. Offsite borrow was found to be the least costly alternative for each plan evaluated in detail. The comparison cost analysis shown in Tables E-1 through E-15 include costs for both on- and offsite borrow. All costs are based on October 1985 price levels.

RECOMMENDED PLANS

4. The detailed cost estimates for the recommended plan which consists of Plans A and E, using offsite borrow, are shown in Tables E-16 and E-17. Similar detailed cost estimates using onsite borrow are shown in Tables E-17 and E-18. As previously stated, offsite borrow is recommended because it is the least costly method for providing suitable levee embankment material and is preferred by local interests. The rationale for determining the recommended plan is discussed in detail in the Main Report. Detail cost estimates for Plan J, off- and onsite borrow, are shown in Tables E-20 and E-21.

5. The recommended Plan A consists of a 4.5-mile-long levee which provides 200-year protection and includes a 50-cubic-foot-per-second (cfs) pumping station with a 10- by 8-foot box culvert and eight minor drainage structures. The recommended Plan E consists of a 10.5-mile-long levee which provides 200-year protection and includes a 250-cfs pumping station with a double 8- by 7-foot box culvert floodgate at the main (large) sump, a 15-cfs pump station with a 5- by 5-foot box culvert floodgate at the Cross Gates (small) sump and six minor drainage structures.

TABLE E-1
COMPARISON COST ANALYSIS
PLAN A
OFFSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan A/SPF							
Floodgates Only	1,815	70	4,278	0	687	445	7,295
15-cfs Pump	1,815	70	4,278	338	741	479	7,721
30-cfs Pump	1,815	70	4,278	441	757	490	7,851
50-cfs Pump	1,815	70	4,278	597	781	506	8,047
150-cfs Pump	1,815	70	4,278	1,279	890	575	8,907
250-cfs Pump	1,815	70	4,278	1,961	997	645	9,766
Plan A/200-Year							
Floodgate Only	1,695	70	3,634	0	586	379	6,364
15-cfs Pump	1,695	70	3,634	338	639	414	6,790
30-cfs Pump	1,695	70	3,634	441	655	424	6,919
50-cfs Pump (NED) a/	1,695	70	3,634	597	680	440	7,116
150-cfs Pump	1,695	70	3,634	1,279	788	510	7,976
250-cfs Pump	1,695	70	3,634	1,961	896	580	8,836
Plan A/100-Year							
Floodgate Only	1,652	70	3,420	0	552	357	6,051
15-cfs Pump	1,652	70	3,420	338	605	385	6,470
30-cfs Pump	1,652	70	3,420	441	621	402	6,606
50-cfs Pump	1,652	70	3,420	597	646	418	6,803
150-cfs Pump	1,652	70	3,420	1,279	754	488	7,663
250-cfs Pump	1,652	70	3,420	1,961	862	558	8,523

a/ Recommended plan.

TABLE E-2
COMPARISON COST ANALYSIS
PLAN A
ONSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item 01/Lands and Damages ($000)	02/Relocations ($000)	11/Levees ($000)	13/Pumping Plants ($000)	30/Engineering and Design ($000)	31/Supervision and Administration ($000)	Total First Cost ($000)
Plan A/SPF							
Floodgates Only	3,212	70	3,197	0	517	334	7,330
15-cfs Pump	3,212	70	3,197	338	570	369	7,756
30-cfs Pump	3,212	70	3,197	441	586	379	7,885
50-cfs Pump	3,212	70	3,197	597	611	395	8,082
150-cfs Pump	3,212	70	3,197	1,279	719	465	8,942
250-cfs Pump	3,212	70	3,197	1,961	827	535	9,802
Plan A/200-Year							
Floodgate Only	2,798	70	2,849	0	461	299	6,477
15-cfs Pump	2,798	70	2,849	338	515	333	6,903
30-cfs Pump	2,798	70	2,849	441	531	344	7,033
50-cfs Pump	2,798	70	2,849	597	556	360	7,230
150-cfs Pump	2,798	70	2,849	1,279	664	430	8,090
250-cfs Pump	2,798	70	2,849	1,961	772	499	8,949
Plan A/100-Year							
Floodgate Only	2,666	70	2,728	0	442	286	6,192
15-cfs Pump	2,666	70	2,728	338	496	321	6,619
30-cfs Pump	2,666	70	2,728	441	512	331	6,748
50-cfs Pump	2,666	70	2,728	597	537	347	6,945
150-cfs Pump	2,666	70	2,728	1,279	645	417	7,805
250-cfs Pump	2,666	70	2,728	1,961	752	487	8,664

TABLE E-3
COMPARISON COST ANALYSIS
PLAN D - SPF PROTECTION
OFFSITE BORROW

Alternative Cross Gates/Main Sump	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees a/	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan D							
Floodgates Only	1,927	434	16,029	0	2,634	1,719	22,743
Floodgate/50-cfs Pump	1,927	434	16,029	497	2,714	1,771	23,372
Floodgate/150-cfs Pump	1,927	434	16,029	1,179	2,823	1,842	24,234
Floodgate/250-cfs Pump	1,927	434	16,029	1,861	2,932	1,913	25,096
Floodgate/500-cfs Pump	1,927	434	16,029	3,576	3,206	2,092	27,264
Floodgate/700-cfs Pump	1,927	434	16,029	4,913	3,420	2,232	28,955
15-cfs Pump/Floodgate	1,927	434	16,029	238	2,672	1,744	23,044
15- and 50-cfs Pumps	1,927	434	16,029	735	2,752	1,796	23,673
15- and 150-cfs Pumps	1,927	434	16,029	1,417	2,861	1,867	24,535
15- and 250-cfs Pumps	1,927	434	16,029	2,099	2,970	1,938	25,397
15- and 500-cfs Pumps	1,927	434	16,029	3,814	3,244	2,117	27,565
15- and 700-cfs Pumps	1,927	434	16,029	5,151	3,458	2,256	29,255
30-cfs Pump/Floodgate	1,927	434	16,029	341	2,689	1,754	23,174
30- and 50-cfs Pumps	1,927	434	16,029	838	2,768	1,806	23,802
30- and 150-cfs Pumps	1,927	434	16,029	1,520	2,877	1,877	24,664
30- and 250-cfs Pumps	1,927	434	16,029	2,202	2,986	1,949	25,527
30- and 500-cfs Pumps	1,927	434	16,029	3,917	3,261	2,127	27,695
30- and 700-cfs Pumps	1,927	434	16,029	5,254	3,475	2,267	29,386
50-cfs Pump/Floodgate	1,927	434	16,029	497	2,714	1,771	23,372
50- and 50-cfs Pumps	1,927	434	16,029	994	2,793	1,823	24,000
50- and 150-cfs Pumps	1,927	434	16,029	1,676	2,902	1,894	24,862
50- and 250-cfs Pumps	1,927	434	16,029	2,358	3,011	1,966	25,725
50- and 500-cfs Pumps	1,927	434	16,029	4,073	3,286	2,144	27,893
50- and 700-cfs Pumps	1,927	434	16,029	5,410	3,500	2,284	29,584

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a/ Cost include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

TABLE E-4
COMPARISON COST ANALYSIS
PLAN D - 200-YEAR PROTECTION
OFFSITE BORROW

Alternative Cross Gates/Main Sump	Cost Account Number/Item: 01/Lands and Damages ($000)	02/Relocations ($000)	11/Levees a/ ($000)	13/Pumping Plants ($000)	30/Engineering and Design ($000)	31/Supervision and Administration ($000)	Total First Cost ($000)
Plan D							
Floodgates Only	1,843	434	15,011	0	2,471	1,612	21,371
Floodgate/50-cfs Pump	1,843	434	15,011	497	2,551	1,664	22,000
Floodgate/150-cfs Pump	1,843	434	15,011	1,179	2,660	1,736	22,863
Floodgate/250-cfs Pump	1,843	434	15,011	1,861	2,769	1,807	23,725
Floodgate/500-cfs Pump	1,843	434	15,011	3,576	3,043	1,986	25,893
Floodgate/700-cfs Pump	1,843	434	15,011	4,913	3,257	2,125	27,583
15-cfs Pump/Floodgate	1,843	434	15,011	238	2,509	1,637	21,672
15- and 50-cfs Pumps	1,843	434	15,011	735	2,589	1,689	22,301
15- and 150-cfs Pumps	1,843	434	15,011	1,417	2,698	1,760	23,163
15- and 250-cfs Pumps	1,843	434	15,011	2,099	2,807	1,832	24,026
15- and 500-cfs Pumps	1,843	434	15,011	3,814	3,081	2,011	26,194
15- and 700-cfs Pumps	1,843	434	15,011	5,151	3,295	2,150	27,884
30-cfs Pump/Floodgate	1,843	434	15,011	341	2,526	1,648	21,803
30- and 50-cfs Pumps	1,843	434	15,011	838	2,606	1,700	22,432
30- and 150-cfs Pumps	1,843	434	15,011	1,520	2,715	1,772	23,295
30- and 250-cfs Pumps	1,843	434	15,011	2,202	2,824	1,843	24,157
30- and 500-cfs Pumps	1,843	434	15,011	3,917	3,098	2,022	26,325
30- and 700-cfs Pumps	1,843	434	15,011	5,254	3,312	2,161	28,015
50-cfs Pump/Floodgate	1,843	434	15,011	497	2,551	1,664	22,000
50- and 50-cfs Pumps	1,843	434	15,011	994	2,631	1,716	22,629
50- and 150-cfs Pumps	1,843	434	15,011	1,676	2,740	1,788	23,492
50- and 250-cfs Pumps	1,843	434	15,011	2,358	2,849	1,859	24,354
50- and 500-cfs Pumps	1,843	434	15,011	4,073	3,123	2,038	26,522
50- and 700-cfs Pumps	1,843	434	15,011	5,410	3,337	2,177	28,212

a/ Cost include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

COMPARISON COST ANALYSIS
PLAN D - 100-YEAR PROTECTION
OFFSITE BORROW

Alternative Cross Gates/Main Sump	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees a/	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan D							
Floodgates Only	1,733	434	14,695	0	2,421	1,580	20,863
Floodgate/50-cfs Pump	1,733	434	14,695	497	2,500	1,631	21,490
Floodgate/150-cfs Pump	1,733	434	14,695	1,179	2,609	1,703	22,353
Floodgate/250-cfs Pump	1,733	434	14,695	1,861	2,718	1,774	23,215
Floodgate/500-cfs Pump	1,733	434	14,695	3,576	2,993	1,953	25,384
Floodgate/700-cfs Pump	1,733	434	14,695	4,913	3,207	2,092	27,074
15-cfs Pump/Floodgate	1,733	434	14,695	238	2,459	1,605	21,164
15- and 50-cfs Pumps	1,733	434	14,695	735	2,538	1,656	21,791
15- and 150-cfs Pumps	1,733	434	14,695	1,417	2,647	1,728	22,654
15- and 250-cfs Pumps	1,733	434	14,695	2,099	2,756	1,799	23,516
15- and 500-cfs Pumps	1,733	434	14,695	3,814	3,031	1,978	25,685
15- and 700-cfs Pumps	1,733	434	14,695	5,151	3,245	2,117	27,375
30-cfs Pump/Floodgate	1,733	434	14,695	341	2,476	1,616	21,295
30- and 50-cfs Pumps	1,733	434	14,695	838	2,555	1,667	21,922
30- and 150-cfs Pumps	1,733	434	14,695	1,520	2,664	1,739	22,785
30- and 250-cfs Pumps	1,733	434	14,695	2,202	2,773	1,810	23,647
30- and 500-cfs Pumps	1,733	434	14,695	3,917	3,048	1,989	25,816
30- and 700-cfs Pumps	1,733	434	14,695	5,254	3,262	2,128	27,506
50-cfs Pump/Floodgate	1,733	434	14,695	497	2,501	1,632	21,492
50- and 50-cfs Pumps	1,733	434	14,695	994	2,580	1,683	22,119
50- and 150-cfs Pumps	1,733	434	14,695	1,676	2,689	1,755	22,982
50- and 250-cfs Pumps	1,733	434	14,695	2,358	2,798	1,826	23,844
50- and 500-cfs Pumps	1,733	434	14,695	4,073	3,075	2,005	26,013
50- and 700-cfs Pumps	1,733	434	14,695	5,410	3,287	2,144	27,703

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a/ Cost include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

TABLE E-6
COMPARISON COST ANALYSIS
PLAN D - SPF PROTECTION
ONSITE BORROW

Alturnative Cross Gates/Main Sump	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees a/	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan D							
Floodgates Only	4,829	434	14,242	0	2,348	1,532	23,385
Floodgate/50-cfs Pump	4,829	434	14,242	497	2,428	1,584	24,014
Floodgate/150-cfs Pump	4,829	434	14,242	1,179	2,537	1,655	24,876
Floodgate/250-cfs Pump	4,829	434	14,242	1,861	2,646	1,726	25,738
Floodgate/500-cfs Pump	4,829	434	14,242	3,576	2,920	1,905	27,906
Floodgate/700-cfs Pump	4,829	434	14,242	4,913	3,134	2,045	29,597
15-cfs Pump/Floodgate	4,829	434	14,242	238	2,386	1,557	23,686
15- and 50-cfs Pumps	4,829	434	14,242	735	2,466	1,609	24,315
15- and 150-cfs Pumps	4,829	434	14,242	1,417	2,575	1,680	25,177
15- and 250-cfs Pumps	4,829	434	14,242	2,099	2,684	1,751	26,039
15- and 500-cfs Pumps	4,829	434	14,242	3,814	2,958	1,930	28,207
15- and 700-cfs Pumps	4,829	434	14,242	5,151	3,172	2,070	29,898
30-cfs Pump/Floodgate	4,829	434	14,242	341	2,403	1,568	23,817
30 - and 50-cfs Pumps	4,829	434	14,242	838	2,483	1,620	24,446
30- and 150-cfs Pumps	4,829	434	14,242	1,520	2,592	1,691	25,308
30- and 250-cfs Pumps	4,829	434	14,242	2,202	2,701	1,762	26,170
30- and 500-cfs Pumps	4,829	434	14,242	3,917	2,975	1,941	28,338
30- and 700-cfs Pumps	4,829	434	14,242	5,254	3,189	2,081	30,029
50-cfs Pump/Floodgate	4,829	434	14,242	497	2,428	1,584	24,014
50- and 50-cfs Pumps	4,829	434	14,242	994	2,508	1,636	24,643
50- and 150-cfs Pumps	4,829	434	14,242	1,676	2,617	1,707	25,505
50- and 250-cfs Pumps	4,829	434	14,242	2,358	2,726	1,778	26,367
50- and 500-cfs Pumps	4,829	434	14,242	4,073	3,000	1,957	28,535
50- and 700-cfs Pumps	4,829	434	14,242	5,410	3,214	2,097	30,226

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a/ Cost include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

TABLE E-7
COMPARISON COST ANALYSIS
PLAN D - 200-YEAR PROTECTION
ONSITE BORROW

Alternative Cross Gates/Main Sump	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees a/	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan D							
Floodgates Only	4,474	434	13,611	0	2,247	1,466	22,232
Floodgate/50-cfs Pump	4,474	434	13,611	497	2,327	1,518	22,861
Floodgate/150-cfs Pump	4,474	434	13,611	1,179	2,436	1,589	23,723
Floodgate/250-cfs Pump	4,474	434	13,611	1,861	2,545	1,661	24,586
Floodgate/500-cfs Pump	4,474	434	13,611	3,576	2,819	1,840	26,754
Floodgate/700-cfs Pump	4,474	434	13,611	4,913	3,033	1,979	28,444
15-cfs Pump/Floodgate	4,474	434	13,611	238	2,285	1,491	22,533
15- and 50-cfs Pumps	4,474	434	13,611	735	2,365	1,543	23,162
15- and 150-cfs Pumps	4,474	434	13,611	1,417	2,474	1,614	24,024
15- and 250-cfs Pumps	4,474	434	13,611	2,099	2,583	1,686	24,887
15- and 500-cfs Pumps	4,474	434	13,611	3,814	2,857	1,865	27,055
15- and 700-cfs Pumps	4,474	434	13,611	5,151	3,071	2,004	28,745
30-cfs Pump/Floodgate	4,474	434	13,611	341	2,302	1,502	22,664
30- and 50-cfs Pumps	4,474	434	13,611	838	2,382	1,554	23,293
30- and 150-cfs Pumps	4,474	434	13,611	1,520	2,491	1,625	24,155
30- and 250-cfs Pumps	4,474	434	13,611	2,202	2,600	1,697	25,018
30- and 500-cfs Pumps	4,474	434	13,611	3,917	2,874	1,876	27,186
30- and 700-cfs Pumps	4,474	434	13,611	5,254	3,088	2,015	28,876
50-cfs Pump/Floodgate	4,474	434	13,611	497	2,327	1,518	22,861
50- and 50-cfs Pumps	4,474	434	13,611	994	2,407	1,570	23,490
50- and 150-cfs Pumps	4,474	434	13,611	1,676	2,516	1,641	24,352
50- and 250-cfs Pumps	4,474	434	13,611	2,358	2,625	1,713	25,215
50- and 500-cfs Pumps	4,474	434	13,611	4,073	2,899	1,892	27,383
50- and 700-cfs Pumps	4,474	434	13,611	5,410	3,113	2,031	29,073

a/ Cost Include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

COMPARISON COST ANALYSIS
PLAN D - 100-YEAR PROTECTION
ONSITE BORROW

Alternative Cross Gates/Main Sump	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees a/	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan D							
Floodgates Only	4,113	434	13,373	0	2,209	1,441	21,570
Floodgate/50-cfs Pump	4,113	434	13,373	497	2,289	1,493	22,199
Floodgate/150-cfs Pump	4,113	434	13,373	1,179	2,398	1,565	23,062
Floodgate/250-cfs Pump	4,113	434	13,373	1,861	2,507	1,636	23,924
Floodgate/500-cfs Pump	4,113	434	13,373	3,576	2,781	1,815	26,092
Floodgate/700-cfs Pump	4,113	434	13,373	4,913	2,995	1,954	27,782
15-cfs Pump/Floodgate	4,113	434	13,373	238	2,247	1,466	21,871
15- and 50-cfs Pumps	4,113	434	13,373	735	2,327	1,518	22,500
15- and 150-cfs Pumps	4,113	434	13,373	1,417	2,436	1,590	23,363
15- and 250-cfs Pumps	4,113	434	13,373	2,099	2,545	1,661	24,225
15- and 500-cfs Pumps	4,113	434	13,373	3,814	2,819	1,840	26,393
15- and 700-cfs Pumps	4,113	434	13,373	5,151	3,033	1,979	28,083
30-cfs Pump/Floodgate	4,113	434	13,373	341	2,264	1,477	22,002
30- and 50-cfs Pumps	4,113	434	13,373	838	2,344	1,529	22,631
30- and 150-cfs Pumps	4,113	434	13,373	1,520	2,453	1,601	23,494
30- and 250-cfs Pumps	4,113	434	13,373	2,202	2,562	1,672	24,356
30- and 500-cfs Pumps	4,113	434	13,373	3,917	2,836	1,851	26,542
30- and 700-cfs Pumps	4,113	434	13,373	5,254	3,050	1,990	28,214
50-cfs Pump/Floodgate	4,113	434	13,373	497	2,289	1,493	22,199
50- and 50-cfs Pumps	4,113	434	13,373	994	2,369	1,545	22,828
50- and 150-cfs Pumps	4,113	434	13,373	1,676	2,478	1,617	23,691
50- and 250-cfs Pumps	4,113	434	13,373	2,358	2,587	1,688	24,553
50- and 500-cfs Pumps	4,113	434	13,373	4,073	2,861	1,867	26,721
50- and 700-cfs Pumps	4,113	434	13,373	5,410	3,075	2,006	28,411

a/ Cost include $9,391,000 ($7,513,000 plus 25 percent contingencies) for navigational floodgate on Doubloon Bayou.

TABLE E-9
COMPARISON COST ANALYSIS
PLAN E - SPF PROTECTION
OFFSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan E							
Floodgates Only	2,373	247	7,525	0	1,232	795	12,172
Floodgate/150-cfs Pump	2,373	247	7,525	1,279	1,435	925	13,784
Floodgate/250-cfs Pump	2,373	247	7,525	1,961	1,543	995	14,644
Floodgate/500-cfs Pump	2,373	247	7,525	3,676	1,815	1,170	16,806
Floodgate/700-cfs Pump	2,373	247	7,525	5,013	2,026	1,307	18,491
Floodgate/1,000-cfs Pump	2,373	247	7,525	6,817	2,312	1,492	20,766
15-cfs Pump/Floodgate	2,373	247	7,525	238	1,270	819	12,472
15- and 150-cfs Pumps	2,373	247	7,525	1,517	1,473	949	14,084
15- and 250-cfs Pumps	2,373	247	7,525	2,199	1,581	1,019	14,944
15- and 500-cfs Pumps	2,373	247	7,525	3,914	1,853	1,194	17,106
15- and 700-cfs Pumps	2,373	247	7,525	5,251	2,064	1,331	18,791
15- and 1,000-cfs Pumps	2,373	247	7,525	7,055	2,350	1,516	21,066
30-cfs Pump/Floodgate	2,373	247	7,525	341	1,286	830	12,602
30- and 150-cfs Pumps	2,373	247	7,525	1,620	1,489	960	14,214
30- and 250-cfs Pumps	2,373	247	7,525	2,302	1,597	1,030	15,074
30- and 500-cfs Pumps	2,373	247	7,525	4,017	1,869	1,205	17,236
30- and 700-cfs Pumps	2,373	247	7,525	5,354	2,080	1,342	18,921
30- and 1,000-cfs Pumps	2,373	247	7,525	7,158	2,366	1,527	21,196
50-cfs Pump/Floodgate	2,373	247	7,525	497	1,311	846	12,799
50- and 150-cfs Pumps	2,373	247	7,525	1,776	1,514	976	14,411
50- and 250-cfs Pumps	2,373	247	7,525	2,458	1,622	1,046	15,271
50- and 500-cfs Pumps	2,373	247	7,525	4,173	1,894	1,221	17,433
50- and 700-cfs Pumps	2,373	247	7,525	5,510	2,105	1,358	19,118
50- and 1,000-cfs Pumps	2,373	247	7,525	7,314	2,391	1,543	21,393

TABLE E-10
COMPARISON COST ANALYSIS
PLAN E - 200-YEAR PROTECTION
OFFSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan E							
Floodgates Only	2,260	247	6,514	0	1,072	691	10,784
Floodgate/150-cfs Pump	2,260	247	6,514	1,279	1,274	822	12,396
Floodgate/250-cfs Pump	2,260	247	6,514	1,961	1,382	892	13,256
Floodgate/500-cfs Pump	2,260	247	6,514	3,676	1,654	1,067	15,418
Floodgate/700-cfs Pump	2,260	247	6,514	5,013	1,866	1,204	17,104
Floodgate/1,000-cfs Pump	2,260	247	6,514	6,817	2,152	1,388	19,378
15-cfs Pump/Floodgate	2,260	247	6,514	238	1,110	715	11,084
15- and 150-cfs Pumps	2,260	247	6,514	1,517	1,312	846	12,696
15- and 250-cfs Pumps (NED) a/	2,260	247	6,514	2,199	1,420	916	13,556
15- and 500-cfs Pumps	2,260	247	6,514	3,914	1,692	1,091	15,718
15- and 700-cfs Pumps	2,260	247	6,514	5,251	1,898	1,228	17,398
15- and 1,000-cfs Pumps	2,260	247	6,514	7,055	2,075	1,412	19,563
30-cfs Pump/Floodgate	2,260	247	6,514	341	1,126	726	11,214
30- and 150-cfs Pumps	2,260	247	6,514	1,620	1,328	857	12,826
30- and 250-cfs Pumps	2,260	247	6,514	2,302	1,436	1,022	13,781
30- and 500-cfs Pumps	2,260	247	6,514	4,017	1,708	1,102	15,848
30- and 700-cfs Pumps	2,260	247	6,514	5,354	1,920	1,239	17,534
30- and 1,000-cfs Pumps	2,260	247	6,514	7,158	2,206	1,423	19,808
50-cfs Pump/Floodgate	2,260	247	6,514	497	1,151	742	11,411
50- and 150-cfs Pumps	2,260	247	6,514	1,776	1,353	873	13,023
50- and 250-cfs Pumps	2,260	247	6,514	2,458	1,461	943	13,883
50- and 500-cfs Pumps	2,260	247	6,514	4,173	1,733	1,118	16,045
50- and 700-cfs Pumps	2,260	247	6,514	5,510	1,945	1,255	17,731
50- and 1,000-cfs Pumps	2,260	247	6,514	7,314	2,231	1,439	20,005

a/ Recommended plan.

TABLE E-11
COMPARISON COST ANALYSIS
PLAN E - 100-YEAR PROTECTION
OFFSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan E							
Floodgates Only	2,164	247	6,235	0	1,027	663	10,336
Floodgate/150-cfs Pump	2,164	247	6,235	1,279	1,230	793	11,948
Floodgate/250-cfs Pump	2,164	247	6,235	1,961	1,338	863	12,808
Floodgate/500-cfs Pump	2,164	247	6,235	3,676	1,610	1,039	14,971
Floodgate/700-cfs Pump	2,164	247	6,235	5,013	1,822	1,175	16,656
Floodgate/1,000-cfs Pump	2,164	247	6,235	6,817	2,108	1,360	18,931
15-cfs Pump/Floodgate	2,164	247	6,235	238	1,065	687	10,636
15- and 150-cfs Pumps	2,164	247	6,235	1,517	1,268	817	12,248
15- and 250-cfs Pumps	2,164	247	6,235	2,199	1,376	887	13,108
15- and 500-cfs Pumps	2,164	247	6,235	3,914	1,648	1,063	15,271
15- and 700-cfs Pumps	2,164	247	6,235	5,251	1,860	1,199	16,956
15- and 1,000-cfs Pumps	2,164	247	6,235	7,055	2,146	1,384	19,231
30-cfs Pump/Floodgate	2,164	247	6,235	341	1,081	698	10,766
30- and 150-cfs Pumps	2,164	247	6,235	1,620	1,284	828	12,378
30- and 250-cfs Pumps	2,164	247	6,235	2,302	1,392	898	13,238
30- and 500-cfs Pumps	2,164	247	6,235	4,017	1,664	1,074	15,401
30- and 700-cfs Pumps	2,164	247	6,235	5,354	1,876	1,210	17,086
30- and 1,000-cfs Pumps	2,164	247	6,235	7,158	2,162	1,395	19,361
50-cfs Pump/Floodgate	2,164	247	6,235	497	1,106	714	10,963
50- and 150-cfs Pumps	2,164	247	6,235	1,776	1,309	844	12,575
50- and 250-cfs Pumps	2,164	247	6,235	2,458	1,417	914	13,435
50- and 500-cfs Pumps	2,164	247	6,235	4,173	1,689	1,090	15,598
50- and 700-cfs Pumps	2,164	247	6,235	5,510	1,901	1,226	17,283
50- and 1,000-cfs Pumps	2,164	247	6,235	7,314	2,187	1,411	19,558

TABLE E-12
COMPARISON COST ANALYSIS
PLAN E - SPF PROTECTION
ONSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						
	01/Lands and Damages ($000)	02/Relocations ($000)	11/Levees ($000)	13/Pumping Plants ($000)	30/Engineering and Design ($000)	31/Supervision and Administration ($000)	Total First Cost ($000)
Plan E							
Floodgates Only	5,471	247	5,502	0	911	588	12,719
Floodgate/150-cfs Pump	5,471	247	5,502	1,279	1,114	719	14,332
Floodgate/250-cfs Pump	5,471	247	5,502	1,961	1,222	788	15,191
Floodgate/500-cfs Pump	5,471	247	5,502	3,676	1,494	964	17,354
Floodgate/700-cfs Pump	5,471	247	5,502	5,013	1,706	1,100	19,039
Floodgate/1,000-cfs Pump	5,471	247	5,502	6,817	1,992	1,285	21,314
15-cfs Pump/Floodgate	5,471	247	5,502	238	949	612	13,019
15- and 150-cfs Pumps	5,471	247	5,502	1,517	1,152	743	14,632
15- and 250-cfs Pumps	5,471	247	5,502	2,199	1,260	812	15,491
15- and 500-cfs Pumps	5,471	247	5,502	3,914	1,538	988	17,660
15- and 700-cfs Pumps	5,471	247	5,502	5,251	1,744	1,124	19,339
15- and 1,000-cfs Pumps	5,471	247	5,502	7,055	2,030	1,309	21,614
30-cfs Pump/Floodgate	5,471	247	5,502	341	965	623	13,149
30- and 150-cfs Pumps	5,471	247	5,502	1,620	1,168	754	14,762
30- and 250-cfs Pumps	5,471	247	5,502	2,302	1,276	823	15,621
30- and 500-cfs Pumps	5,471	247	5,502	4,017	1,570	999	17,806
30- and 700-cfs Pumps	5,471	247	5,502	5,354	1,760	1,135	19,469
30- and 1,000-cfs Pumps	5,471	247	5,502	7,158	2,046	1,320	21,744
50-cfs Pump/Floodgate	5,471	247	5,502	497	990	639	13,346
50- and 150-cfs Pumps	5,471	247	5,502	1,776	1,193	770	14,959
50- and 250-cfs Pumps	5,471	247	5,502	2,458	1,301	839	15,818
50- and 500-cfs Pumps	5,471	247	5,502	4,173	1,573	1,015	17,981
50- and 700-cfs Pumps	5,471	247	5,502	5,510	1,785	1,151	19,666
50- and 1,000-cfs Pumps	5,471	247	5,502	7,314	2,071	1,336	21,941

TABLE E-13
COMPARISON COST ANALYSIS
PLAN E - 200-YEAR PROTECTION
ONSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item 01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	Total First Cost
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan E							
Floodgates Only	5,131	247	1,965	0	826	533	11,702
Floodgate/150-cfs Pump	5,131	247	4,965	1,279	1,029	664	13,315
Floodgate/250-cfs Pump	5,131	247	4,965	1,961	1,137	733	14,174
Floodgate/500-cfs Pump	5,131	247	4,965	3,676	1,409	909	16,337
Floodgate/700-cfs Pump	5,131	247	4,965	5,013	1,621	1,045	18,022
Floodgate/1,000-cfs Pump	5,131	247	4,965	6,817	1,907	1,230	20,297
15-cfs Pump/Floodgate	5,131	247	4,965	238	864	557	12,002
15- and 150-cfs Pumps	5,131	247	4,965	1,517	1,067	688	13,615
15- and 250-cfs Pumps	5,131	247	4,965	2,199	1,175	758	14,475
15- and 500-cfs Pumps	5,131	247	4,965	3,914	1,447	933	16,637
15- and 700-cfs Pumps	5,131	247	4,965	5,251	1,659	1,069	18,322
15- and 1,000-cfs Pumps	5,131	247	4,965	7,055	1,945	1,254	20,597
30-cfs Pump/Floodgate	5,131	247	4,965	341	880	568	12,132
30- and 150-cfs Pumps	5,131	247	4,965	1,6[illegible]	1,083	699	13,745
30- and 250-cfs Pumps	5,131	247	4,965	2,[illegible]2	1,191	768	14,604
30- and 500-cfs Pumps	5,131	247	4,965	4,017	1,463	944	16,767
30- and 700-cfs Pumps	5,131	247	4,965	5,354	1,675	1,080	18,452
30- and 1,000-cfs Pumps	5,131	247	4,965	7,158	1,961	1,265	20,727
50-cfs Pump/Floodgate	5,131	247	4,965	497	905	584	12,329
50- and 150-cfs Pumps	5,131	247	4,965	1,776	1,108	715	13,942
50- and 250-cfs Pumps	5,131	247	4,965	2,458	1,216	784	14,801
50- and 500-cfs Pumps	5,131	247	4,965	4,173	1,488	960	16,964
50- and 700-cfs Pumps	5,131	247	4,965	5,510	1,700	1,096	18,649
50- and 1,000-cfs Pumps	5,131	247	4,965	7,314	1,986	1,281	20,924

TABLE E-14
COMPARISON COST ANALYSIS
PLAN E - 100-YEAR PROTECTION
ONSITE BORROW

Alternative/ Level of Protection	Cost Account Number/Item						Total First Cost
	01/Lands and Damages	02/Relocations	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan E							
Floodgates Only	4,563	247	4,770	0	795	513	10,888
Floodgate/150-cfs Pump	4,563	247	4,770	1,279	998	644	12,501
Floodgate/250-cfs Pump	4,563	247	4,770	1,961	1,106	713	13,360
Floodgate/500-cfs Pump	4,563	247	4,770	3,676	1,378	889	15,523
Floodgate/700-cfs Pump	4,563	247	4,770	5,013	1,590	1,025	17,208
Floodgate/1,000-cfs Pump	4,563	247	4,770	6,817	1,876	1,210	19,483
15-cfs Pump/Floodgate	4,563	247	4,770	238	833	537	11,188
15- and 150-cfs Pumps	4,563	247	4,770	1,517	1,036	668	12,801
15- and 250-cfs Pumps	4,563	247	4,770	2,199	1,144	737	13,660
15- and 500-cfs Pumps	4,563	247	4,770	3,914	1,416	913	15,823
15- and 700-cfs Pumps	4,563	247	4,770	5,251	1,628	1,049	17,508
15- and 1,000-cfs Pumps	4,563	247	4,770	7,055	1,914	1,225	19,774
30-cfs Pump/Floodgate	4,563	247	4,770	341	849	548	11,318
30- and 4,017fs Pumps	4,563	247	4,770	1,620	1,052	679	12,931
30- and 250-cfs Pumps	4,563	247	4,770	2,302	1,160	748	13,790
30- and 500-cfs Pumps	4,563	247	4,770	4,017	1,432	924	15,953
30- and 700-cfs Pumps	4,563	247	4,770	5,354	1,644	1,060	17,638
30- and 1,000-cfs Pumps	4,563	247	4,770	7,158	1,930	1,245	19,913
50-cfs Pump/Floodgate	4,563	247	4,770	497	874	564	11,515
50- and 150-cfs Pumps	4,563	247	4,770	1,776	1,077	695	13,128
50- and 250-cfs Pumps	4,563	247	4,770	2,458	1,185	764	13,987
50- and 500-cfs Pumps	4,563	247	4,770	4,173	1,457	940	16,150
50- and 700-cfs Pumps	4,563	247	4,770	5,510	1,669	1,076	17,835
50- and 1,000-cfs Pumps	4,563	247	4,770	7,314	1,955	1,261	20,110

TABLE E-15
COMPARISON COST ANALYSIS
PLAN J a/

Alternative b/	Cost Account Number/Item								Total First Cost
	01/Lands and Damages	02/Relocations	08/Bridges	09/Channels and Canals	11/Levees	13/Pumping Plants	30/Engineering and Design	31/Supervision and Administration	
	($000)	($000)	($000)	($000)	($000)	($000)	($000)	($000)	($000)
Plan J/Offsite Borrow									
SPF	2,234	282	3,000	31	6,605	238	1,625	1,060	15,075
200-Year	2,172	282	3,000	31	5,927	238	1,516	990	14,156
100-Year	2,069	282	3,000	31	5,765	238	1,491	975	13,849
Plan J/Onsite Borrow									
SPF	4,399	282	3,000	31	5,029	238	1,373	896	15,248
200-Year	3,972	282	3,000	31	4,646	238	1,312	856	14,337
100-Year	3,698	282	3,000	31	4,535	238	1,294	844	13,922

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a/ Costs based on a 15-cfs pumping station at Cross Gates Sump which was determined to be the economically optimum pump size (Cross Gates Sump for Plan J same as for Plan E). Costs include a new bridge at US 90 that could be used to mitigate for stage increases caused by Plan J (see discussion in paragraph 148, page 44, of the Main Report).

b/ Level of protection (i.e., SPF, 200-year, and 100-year) based on headwater (river) flood events. Plan J does not provide protection from hurricane flooding.

TABLE E-16

RECOMMENDED PLAN - PLAN A

200-YEAR PROTECTION - 50-CFS PUMP WITH FLOODGATE

OFFSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
01	Lands and Damages				
	Residential Lands	acre	61	10,000	610
	Improvements				350
	Severence Damages				85
	Total Lands and Damages				1,045
	Contingencies	percent	25	--	261
	Total Lands and Contingencies	--	--	--	1,306
	Acquisition Costs	ownerships	60	5,000	300
	Public Law 91-646 Costs	--	--	--	89
	Total Estimated Real Estate Cost	--	--	--	1,695
02	Relocations				
	Bridge	job	--	--	--
	Parking Lot	job	1	--	10
	Road	job	3	--	15
	Telephone Cable	job	1	--	3
	Television Cable	job	--	--	--
	Powerline	job	5	--	22.5
	Waterline	job	--	--	--
	Gasline	job	--	--	--
	Contingencies	percent	25	--	13
	Owner's Engineering and Design	percent	10	--	6.5
	Subtotal Relocations				70
11	Levee and Floodwalls				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	45	1,400	63
	Levee Embankment	cubic yard	313,800	4.35	1,365
	Gravel Surfacing	cubic yard	11,200	15.00	168
	Turfing	acre	50	700	35
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	8	--	596
	Major Structure	job	1	--	631
	Contingencies	percent	25	--	726
	Subtotal Levee and Floodwalls				3,634

TABLE E-16 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost	Total
				($)	($000)
13	Pumping Plants				
	Pumping Plant (50 cfs)	job	1	--	478
	Contingencies	percent	25	--	119
	Subtotal Pumping Plants				597
30	Engineering and Design	--	--	--	680
31	Supervision and Administration	--	--	--	440
	TOTAL FIRST COST				7,116

TABLE E-17
PLAN A
200-YEAR PROTECTION - 50-CFS PUMP WITH FLOODGATE
ONSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
01	Lands and Damages				
	Residential Lands	acre	116	10,000	1,160
	Improvements				400
	Severence Damages				160
	Total Lands and Damages				1,720
	Contingencies	percent	25	--	430
	Total Lands and Contingencies	--	--	--	2,150
	Acquisition Costs	ownerships	100	5,000	500
	Public Law 91-646 Costs	--	--	--	148
	Total Estimated Real Estate Cost	--	--	--	2,798
02	Relocations				
	Bridge	job	--	--	--
	Parking Lot	job	1	--	10
	Road	job	3	--	15
	Telephone Cable	job	1	--	3
	Television Cable	job	--	--	--
	Powerline	job	5	--	22.5
	Waterline	job	--	--	--
	Gasline	job	--	--	--
	Contingencies	percent	25	--	13
	Owner's Engineering and Design	percent	10	--	6.5
	Subtotal Relocations				70
11	Levee and Floodwalls				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	45	1,400	63
	Borrow Area	acre	55	1,400	77
	Levee Embankment	cubic yard	313,800	2.10	659
	Gravel Surfacing	cubic yard	11,200	15.00	168
	Turfing	acre	50	700	35
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	8	--	596
	Major Structure	job	1	--	631
	Contingencies	percent	25	--	570
	Subtotal Levee and Floodwalls				2,849

TABLE E-17 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost	Total
				($)	($000)
13	Pumping Plants				
	Pumping Plant (50 cfs)	job	1	--	478
	Contingencies	percent	25	--	119
	Subtotal Pumping Plants				597
30	Engineering and Design	--	--	--	556
31	Supervision and Administration	--	--	--	360
	TOTAL FIRST COST				7,230

TABLE E-18
RECOMMENDED PLAN - PLAN E (NED)
200-YEAR PROTECTION - 250- AND 15-CFS PUMPS WITH FLOODGATES
OFFSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
01	Lands and Damages				
	Residential Lands	acre	117	10,000	1,170
	Improvements				200
	Severence Damages				117
	Total Lands and Damages				1,487
	Contingencies	percent	25	--	372
	Total Lands and Contingencies	--	--	--	1,859
	Acquisition Costs	ownerships	72	5,000	360
	Public Law 91-646 Costs	--	--	--	41
	Total Estimated Real Estate Cost	--	--	--	2,260
02	Relocations				
	Bridge	job	--	--	--
	Parking Lot	job	--	--	--
	Road	job	7	--	58
	Telephone Cable	job	9	--	37
	Television Cable	job	2	--	2
	Powerline	job	9	--	58
	Waterline	job	5	--	22
	Gasline	job	1	--	3
	Contingencies	percent	25	--	45
	Owner's Engineering and Design	percent	10	--	22
	Subtotal Relocations				247
11	Levee and Floodwall				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	79	1,400	110.6
	Borrow Area	acre	--	--	--
	Levee Embankment	cubic yard	656,100	4.35	2,854
	Gravel Surfacing	cubic yard	25,810	15.00	387.2
	Turfing	acre	138	700	96.6
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	6	--	610
	Major Structure	job	2	--	1,103
	Contingencies	percent	25	--	1,302.6
	Subtotal Levee and Floodwalls				6,514

TABLE E-18 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost	Total
				($)	($000)
13	Pumping Plants				
	Pumping Plants				
	Main (Large) Sump (250 cfs)	job	1	--	1,569
	Cross Gates (Small) Sump (15 cfs)	job	1	--	190
	Contingencies	percent	25	--	440
	Subtotal Pumping Plants				2,199
30	Engineering and Design	--	--	--	1,420
31	Supervision and Administration	--	--	--	916
	TOTAL FIRST COST				13,556

TABLE E-19
PLAN E
200-YEAR PROTECTION - 250- AND 15-CFS PUMPS WITH FLOODGATES
ONSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
01	Lands and Damages				
	Residential Lands	acre	286	10,000	2,860
	Improvements				200
	Severence Damages				286
	Total Lands and Damages				3,346
	Contingencies	percent	25	--	837
	Total Lands and Contingencies	--	--	--	4,183
	Acquisition Costs	ownerships	170	5,000	850
	Public Law 91-646 Costs	--	--	--	98
	Total Estimated Real Estate Cost	--	--	--	5,131
02	Relocations				
	Bridge	job	--	--	--
	Parking Lot	job	--	--	--
	Road	job	7	--	58
	Telephone Cable	job	9	--	37
	Television Cable	job	2	--	2
	Powerline	job	9	--	58
	Waterline	job	5	--	22
	Gasline	job	1	--	3
	Contingencies	percent	25	--	5
	Owner's Engineering and Design	percent	10	--	22
	Subtotal Relocations				247
11	Levee and Floodwalls				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	79	1,400	110.6
	Borrow Area	acre	169	1,400	236.6
	Levee Embankment	cubic yard	656,100	2.10	1,377.8
	Gravel Surfacing	cubic yard	25,810	15.00	387.2
	Turfing	acre	138	700	96.6
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	6	--	610
	Major Structure	job	2	--	1,103
	Contingencies	percent	25	--	993.2
	Subtotal Levee and Floodwalls				4,955

TABLE E-19 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
13	Pumping Plants				
	Pumping Plants				
	Main (Large) Sump (250 cfs)	job	1	--	1,569
	Cross Gates (Small) Sump (15 cfs)	job	1	--	190
	Contingencies	percent	25	--	440
	Subtotal Pumping Plants				2,199
30	Engineering and Design	--	--	--	1,175
31	Supervision and Administration	--	--	--	758
	TOTAL FIRST COST				14,475

TABLE E-20
PLAN J
200-YEAR PROTECTION - 15-CFS PUMP WITH FLOODGATES [a]
OFFSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
01	Lands and Damages				
	Residential Lands	acre	95	10,000	950
	Woodlands	acre	6	200	1.2
	Improvements				200
	Severence Damages				100.8
	Total Lands and Damages				1,252
	Contingencies	percent	25	--	314
	Total Lands and Contingencies	--	--	--	1,566
	Acquisition Costs	ownerships	110	5,000	550
	Public Law 91-646 Costs	--	--	--	56
	Total Estimated Real Estate Cost	--	--	--	2,172
02	Relocations				
	Bridge	job	1	--	61
	Parking Lot	job	--	--	--
	Road	job	5	--	62
	Telephone Cable	job	6	--	20
	Television Cable	job	2	--	2
	Powerline	job	6	--	37
	Waterline	job	5	--	15
	Gasline	job	3	--	9
	Contingencies	percent	25	--	51
	Owner's Engineering and Design	percent	10	--	25
	Subtotal Relocations				282
08	Bridges				
	Bridge at US 90	job	1	--	2,400
	Contingencies	percent	25	--	600
	Subtotal Bridges				3,000
09	Channels and Canals				
	Selective Clearing and Snagging Doubloon Bayou	mile	0.5	50,000	25
	Contingencies	percent	25	--	6
	Subtotal Channels and Canals				31

TABLE E-20 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost ($)	Total ($000)
11	Levee and Floodwalls				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	62	1,400	86.8
	Borrow Area	acre	--	--	--
	Levee Embankment	cubic yard	535,028	4.35	2,327.4
	Gravel Surfacing	cubic yard	20,580	15.00	308.7
	Turfing	acre	90	700	63
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	9	--	803
	Major Structure	job	2	--	1,103
	Contingencies	percent	25	--	1,185.1
	Subtotal Levee and Floodwalls				5,927
13	Pumping Plants				
	Pumping Plants				
	Main (Large) Sump	job	--	--	--
	Cross Gates (Small) Sump (15 cfs)	job	1	--	190
	Contingencies	percent	25	--	48
	Subtotal Pumping Plants				238
30	Engineering and Design	--	--	--	1,516
31	Supervision and Administration	--	--	--	990
	TOTAL FIRST COST [b]				14,156

---

[a] Level of protection based on headwater (river) flood events. Plan J does not provide protection from hurricane flooding.

[b] Total first cost includes a new bridge at US 90 that could be used to mitigate for stage increases caused by Plan J (see discussion in paragraph 148, page 44, of the Main Report).

TABLE E-21
PLAN J
200-YEAR PROTECTION - 15-CFS PUMP WITH FLOODGATES [a/]
ONSITE BORROW

Cost Account No.	Item	Unit	Quantity	Unit Cost	Total
				($)	($000)
01	Lands and Damages				
	Residential Lands	acre	225	10,000	2,250
	Woodlands	acre	6	200	1.2
	Improvements				200
	Severance Damages				200.8
	Total Lands and Damages				2,652
	Contingencies	percent	25	--	663
	Total Lands and Contingencies	--	--	--	3,315
	Acquisition Costs	ownerships	120	5,000	600
	Public Law 91-646 Costs	--	--	--	57
	Total Estimated Real Estate Cost	--	--	--	3,972
02	Relocations				
	Bridge	job	1	--	61
	Parking Lot	job	--	--	--
	Road	job	5	--	62
	Telephone Cable	job	6	--	20
	Television Cable	job	2	--	2
	Powerline	job	6	--	37
	Waterline	job	5	--	15
	Gasline	job	3	--	9
	Contingencies	percent	25	--	51
	Owner's Engineering and Design	percent	10	--	25
	Subtotal Relocations				282
08	Bridges				
	Bridge at US 90	job	1	--	2,400
	Contingencies	percent	25	--	600
	Subtotal Bridges				3,000
09	Channels and Canals				
	Selective Clearing and Snagging Doubloon Bayou	mile	0.5	50,000	25
	Contingencies	percent	25	--	6
	Subtotal Channels and Canals				31

TABLE E-21 (Cont)

Cost Account No.	Item	Unit	Quantity	Unit Cost	Total
				($)	($000)
11	Levee and Floodwalls				
	Clearing and Grubbing				
	Levee and Appurtenant Structure	acre	62	1,400	86.8
	Borrow Area	acre	128	1,400	179.2
	Levee Embankment	cubic yard	535,028	2.10	1,123.6
	Gravel Surfacing	cubic yard	20,580	15.00	308.7
	Turfing	acre	90	700	63
	Mobilization and Demobilization	job	--	--	50
	Floodgates				
	Minor Structure	job	9	--	803
	Major Structure	job	2	--	1,103
	Contingencies	percent	25	--	928.7
	Subtotal Levee and Floodwalls				4,646
13	Pumping Plants				
	Pumping Plants				
	Main (Large) Sump	job	--	--	--
	Cross Gates (Small) Sump (15 cfs)	job	1	--	190
	Contingencies	percent	25	--	48
	Subtotal Pumping Plants				238
30	Engineering and Design	--	--	--	1,312
31	Supervision and Administration	--	--	--	856
	TOTAL FIRST COST [b/]				14,337

---

a/ Level of protection based on headwater (river) flood events. Plan J does not provide protection from hurricane flooding.

b/ Total first cost includes a new bridge at US 90 that could be used to mitigate for stage increases caused by Plan J (see discussion in paragraph 148, page 44, of the Main Report).

OTHER CONSIDERATIONS

6. A floodwall approximately 340 feet in length may be required in place of levees to prevent the acquisition of a large expensive home. This determination would be made during the detailed engineering and design studies. The possible location for this floodwall is shown on Plate J-11. For this 340-foot reach, a 3.5-foot floodwall would cost approximately $143,000 (including contingencies, engineering and design, and supervision and administration) more than for a levee of the same height and length. The structural value of the home in question is more than three times this amount; therefore, if necessary, floodwall construction would be more economical than acquisition. The additional $143,000 that would be required to construct this floodwall would have no effect on the economic feasibility of Plan A.

COSTS

UNIT COSTS

7. Unit costs are derived as follows:

a. Levees, earthwork and incidental work. Based on bid experience from similar jobs in the area, adapted to specific features of this project.

b. Drainage structures. Based on preliminary designs, quantities and prices prevailing for similar jobs in the District.

c. Pumping plants. Based on empirical curves for various components and compared to costs for other jobs in the area. Pumping plants are built in conjunction with drainage structures which would serve as the gravity flow section of the plant.

d. An allowance of 25 percent is included for contingencies for all items. Values of engineering and design and supervision and administration are based on anticipated needs for these items during a normal construction schedule. Costs are based on October 1985 price levels.

LANDS

8. Real estate appraisals were made using aerial mosaics and other available maps of the area. Field trips were made to inspect lands involved. The estimates are based on a study of sales and general knowledge of land values in the area and included requirements of Public Law 91-646. Permanent easements will be required for levee rights-of-way and fee title for the major structures such as the pumping plants. Real estate appraisals were based on fee title for all lands. For the purposes of this study, the real estate

costs for both a permanent easement and fee title were assumed to be the same. The average cost for an acre of land for the recommended plan was approximately $10,000 per acre.

RELOCATIONS

9. Road and utility relocation costs were determined from aerial mosaics, quadrangles, and field investigations. These costs reflect the cost of relocating or replacing an existing facility along the proposed levee alignments. Examples of items that will require relocation are roads, powerlines, telephone cables, television cables, waterlines, gaslines, bridges, and parking lots.

LEVEES

10. Cost estimates for levees, earthwork and incidental work are based on bid experience from similar jobs in the area adapted to specific features of this project. Costs include clearing and grubbing the levee rights-of-way, hauling fill material from offsite borrow areas, processing and placing fill material, placing a 16-foot gravel roadbed on the levee crown, seeding or sodding the levee side slopes (turfing), and mobilizing and demobilizing construction equipment. As previously discussed, a floodwall may be required for a small reach of Plan A and possibly other sites. This determination would be made in detailed engineering and design studies.

PUMPING PLANTS AND FLOODGATES

11. Costs for pumping plants and floodgates are based on empirical curves for various components and compared to costs for other jobs in the area. Pumping plants are built in conjunction with drainage structures which would serve as the gravity flow section of the plant. Costs for major and minor drainage structures are based on preliminary designs, quantities, and prices prevailing for similar jobs in the Vicksburg District.

OPERATION AND MAINTENANCE

12. Table E-22 summarizes the annual operation and maintenance costs for the recommended plan.

TABLE E-22
ANNUAL OPERATION AND MAINTENANCE COSTS
RECOMMENDED PLAN

Plan	Level of Protection	Pump Size	Pump: Electric Cost	Pump: Operation Cost	Pump: Maintenance Cost[a]	Levees and Floodgates[b]	Total
	(Year)	(cfs)	($)	($)	($)	($)	($)
A	200	50	11,800	7,800	11,100	20,500	51,200
E	200	250 and 15	45,200	15,400	18,000	23,800	102,400
Total	--	--	57,000	23,200	29,100	44,300	153,600

[a] Includes major replacement costs for pumps.

[b] Major replacement costs for minor floodgates are based on using concrete pressure pipe.

Levees and Floodgates

13. The annual operation and maintenance costs associated with the levees and floodgates include labor required to spray and mow the levees, maintain the gravel roadbed on top of the levee, operate and maintain the floodgates, major replacement costs for the floodgates, remove debris, and inspect the structures.

Pumping Plants

14. Electric motors were selected for analysis in this report with power to be provided by local utility companies. Telephone contacts were made with local utilities to determine electric costs. Operation and maintenance costs for the pumping plants and major floodgates are based on anticipated labor requirements, repairs, engineering and design, inspection and evaluation, and supervision and administration costs. Major replacement costs for pumps were assumed to occur in the 51st year of the project life and were annualized over this period.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX F
ENVIRONMENTAL ANALYSIS

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SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX F
ENVIRONMENTAL ANALYSIS

INTRODUCTION

GENERAL

1. The task of describing present and future environmental perspectives for the Slidell-Pearlington study area is problematic because of the great variety of biota and the intricate interrelationships between the natural environment and man's activities. Flood control is the impetus of the current study. Urban development and encroachment within the lower Pearl River flood plain have resulted in recurring economic losses due to natural flooding events.

LOCATION

2. The 65,000-acre study area is located in St. Tammany Parish, Louisiana, and Hancock County, Mississippi (Plate J-1). The St. Tammany Parish portion of the study area is located east of the Slidell, Louisiana, city limits and extends from the town of Pearl River on the north and to U. S. Highway 90 on the south. The study area extends eastward to the Louisiana-Mississippi state line and encompasses the unincorporated community of Pearlington, Mississippi. Approximately 26,200 acres of the study area located between the West Pearl River and the East Pearl River are part of the state-owned Pearl River Wildlife Management Area (WMA). (Figure 1)

EXISTING FEDERAL PROJECTS

3. Currently authorized Federal projects within this reach of the Lower Pearl River Basin are navigation related. The 58-mile Pearl River navigation project was authorized by the 1935 River and Harbor Act (House Document 408, 75th Congress, 2nd Session). Subsequently, the 1966 River and Harbor Act (House Document 482, 89th Congress, 2nd Session) provided for modifications, specifically the construction of cutoffs and easement of critical bends at eight locations below Lock No. 1 on the West Pearl River. Flood control was not considered as a project purpose.

4. The East Pearl navigation project was authorized by the River and Harbor Act of 25 June 1910 and completed in 1911.

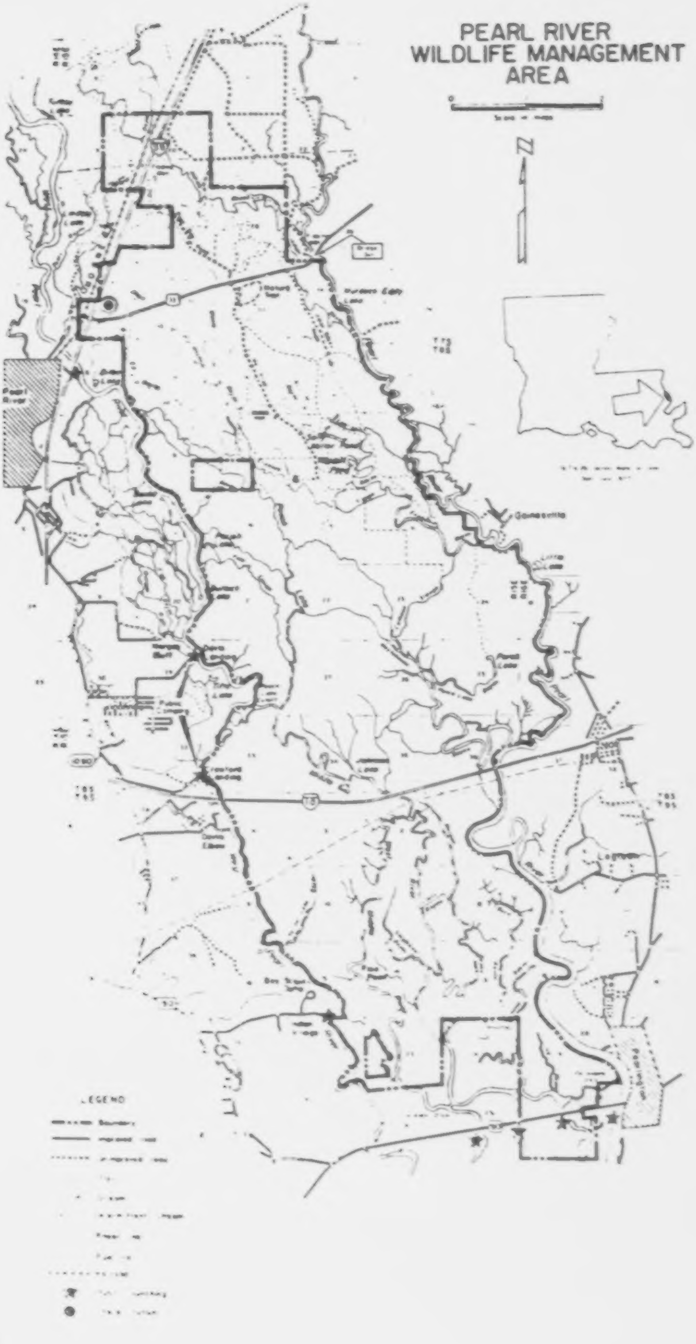
PEARL RIVER
WILDLIFE MANAGEMENT
AREA
N
Gainesville
Pearl River
LEGEND
Boundary

Figure F-1

SCOPE OF STUDY

5. The purpose of the Slidell-Pearlington Study was to investigate the feasibility of various measures to provide headwater flood protection for the urbanized areas along the West and East Pearl Rivers that were subjected to major flooding events in 1979, 1980, and 1983. The scope of the study is related strictly to flood control and its related impact.

Study Authority

6. The Slidell, Louisiana, and Pearlington, Mississippi, flood control study is being conducted as an interim study of the Pearl River Basin. It was authorized by eight Congressional resolutions including two for which studies were already funded. The resolutions are listed below.

Date	Resolution	Committee
1 Apr 63	Town Creek at Jackson, Mississippi	Senate Public Works
27 Jun 67	Town Creek at Jackson, Mississippi, downstream to Byram	Senate Public Works
12 Mar 74	Pearl River Basin, Mississippi and Louisiana	Senate Public Works
1 Feb 79	Richland Creek, Richland, Mississippi	Senate Environment and Public Works
9 May 79	Pearl River Basin, Mississippi and Louisiana	Senate Environment and Public Works
9 May 79	Richland, Mississippi	House Public Works and Transportation
9 May 79	Pearl River Basin, Mississippi and Louisiana	House Public Works and Transportation
9 May 79	Pearl River, Mississippi	House Public Works and Transportation

ENVIRONMENTAL SETTING WITHOUT THE PROJECT

PHYSICAL SETTING

7. The physical geography of the Lower Pearl River Basin is typical of many rivers in the southeastern United States. The low stream gradient and broad, flat flood plain produce extensive meanders, natural cutoffs, oxbow lakes, old river runs, bayous, and extensive forested flood plains. The study area is part of an area known as the Coastal Flatwoods. The terrain is basically flat with elevations ranging from 0 to 35 feet, National Geodetic Vertical Datum (NGVD).

8. Drainage is generally poor with large areas subjected to some degree of annual flooding. The intensity of flooding varies from year to year or from one flooding period to another during the same year. Areas south of Interstate 10 are subject to some tidal action and hurricane storm surges. The area's humid subtropical climate produces mild winters and temperate summers with a mean annual temperature of approximately 67 degrees F. Average annual precipitation is 63 inches with July being the wettest month receiving 6.76 inches of rain. Soils in the northern part of the study area are predominantly inceptisols (U. S. Geological Survey (USGS), 1967). Between Interstate 10 and US 90, the soils change to histosols or peat and muck (Lyle and Sturgis, 1962). The inceptisols are generally of the poorly drained Bibb and Mantachie Series from the Haplaquepts Groups. Several areas along the West Pearl have more sandy soils. Because of scouring during flood periods, peat apparently does not accumulate in the northern portion.

SOCIOECONOMIC CONDITIONS

9. The Slidell-Pearlington area has experienced significant changes in the last two decades. Employment within the area increased approximately 42 percent during the period 1969-1978. Data from the 1980 Census indicate a population of 135,406 in the St. Tammany Parish-Hancock County area, a 67 percent increase over 1970. St. Tammany Parish, classified as a suburb of greater New Orleans, exhibited a stronger rate of growth at 74 percent. Between 1960 and 1980, the city of Slidell experienced a population growth rate of 320 percent. The major source of employment in the study area is government-related, in particular the National Space Test Laboratory (NSTL) facility and the National Aeronautic Space Administration (NASA) computer center. Due to its proximity to New Orleans and according to 1982 figures published by the St. Tammany Parish Department of Development, more than 60 percent of the local work force were commuting out of the parish.

WATER RESOURCES

10. The study area contains 5,778 acres of various water bodies including approximately 38 miles of streams, 12 bayous, and numerous lakes and ponds of

varying sizes. In addition to the apparent open water areas, the area contains large tracts of fresh, intermediate and brackish marshes. Scattered throughout the more upland portions of the study area are numerous pitcher plant bogs where the water table is at or near the ground surface elevation. Approximately 70 percent of the study area is classified as being within the 100-year flood plain.

Ground Water

11. Ground water for the study area is from the Slidell aquifer which occurs primarily in southern St. Tammany Parish. The aquifer occurs below the depth of 2,100 feet at Slidell. The aquifer typically ranges from 100 to 200 feet in thickness. Wells in the aquifer have very high yields. Three wells belonging to the city of Slidell have an estimated free flow of 4,000, 3,250, and 2,100 gallons per minute. The nonflowing artesian heads are about 100 feet above land surface. The average pumpage for the city of Slidell was 3.2 millon gallons per day during 1974. Dissolved solids in the aquifer are about 150 to 250 mg/l. The pH is about 8.0 to 8.5 and hardness is less than 10 mg/l. Temperature ranges from 28 degrees C to 36.5 degrees C. Iron is generally less than 0.15 mg/l and manganese less than 0.05 mg/l. The concentration of hydrogen sulfide averages about 0.3 mg/l from wells of the Slidell Municipal Water System. Hydrogen sulfide in water from these wells has reached as much as 0.6 mg/l. Color is generally less than 20 platinum-cobalt units. The concentration of fluorides ranges from 0.2 to 0.5 mg/l (State of Louisiana Water Resources Technical Report No. 15, 1978).

Surface Water Quality

12. Surface water quality in most streams in the Pearl River Basin is generally suitable for most uses. However, land clearing in the upper Basin and urbanization along various reaches of the Pearl River are adversely impacting the surface water quality. Violations of various water quality criteria have been reported north of the study area below the cities of Jackson, Mississippi, and Bogalusa, Louisiana. The West Pearl River is listed in the Louisiana Natural and Scenic Streams System, which is an indication of high surface water quality.

AQUATIC RESOURCES

13. The aquatic system within the study area is separated into three ecological types--rivers and streams, lakes, and estuary. This aquatic system supports a diverse fish fauna. There are 133 species of fish known in the Pearl River Basin (Suttkus, 1980). The majority of these species are primarily freshwater, but there are 17 species of oceanic or estuarine species that enter the lower Pearl River. Six species of anadramous/catadramous

fishes occur in the Pearl, but the extent of usage by these species is not known. Fishing pressure varies, but due to increasing human populations within the study area, demands on the fishery resource are increasing.

14. Of the 17 species, exclusive of saltwater, considered sport fish, centrarchidae are considered to be the major sport species. Sixteen species, exclusive of saltwater, are utilized in commercial fishery operations. The major commercial fishes include channel, blue, and flathead catfish; yellow bullhead; small-mouth buffalo; river and blacktail redhorse; freshwater drum; paddlefish; and gar. In the lower reach, the estuary and associated marshes provide an important fish and shellfish production and harvest area.

15. There are few density figures for fish populations within the area. Fish population data for Doubloon Bayou, a major study area tributary, were estimated by Victor Lambou in the 1950's. Lambou estimated that available size game fish in Doubloon Bayou was 21.9 pounds per acre. It was also estimated that in other Pearl River backwater areas the figure was 27.7 pounds per acre.

WETLANDS

16. Wetlands are transition lands between terrestrial and aquatic systems and include a variety of areas. Cypress-tupelo swamps and marshes are immediately recognized as wetlands. Determining the extent of and the upland limits of wetlands is often a difficult task. The Vicksburg District has determined that approximately 68 percent (44,200 acres) of the study area is subject to regulatory action under the Clean Water Act. The approximate extent of wetlands in the study area is depicted on Plate J-24. These areas serve as temporary storage areas for out-of-bank overflow. Other wetland processes include infiltration of water, recharge to ground water, sediment fallout, debris entrapment, and detrital input to the riverine system.

Fritchie Marsh

17. The privately owned ecologically significant Fritchie Marsh wetland complex encompasses approximately 6,393 acres which vary from freshwater marsh on the northern periphery to brackish estuarine on the south with some scattered pine islands. These existing conditions are in marked contrast to conditions in 1948 when the marsh was predominately classified as freshwater marsh. As with other Louisiana marshes, regional and local subsidence and saltwater intrusion play important roles. Fritchie Marsh is presently undergoing apparent subsidence as a result of rising mean gulf water levels. According to Hicks (1968), apparent subsidence in Fritchie Marsh is estimated to be 0.1

to 0.17 cm per year at present. The primary freshwater sources to the marsh apparently are local runoff and ground water. During low to moderate flows in the Pearl River, very little water flows from the West Pearl into the marsh. At higher stages (e.g., 25-year or greater flood events), river water flows into the marsh through Doubloon Bayou on the north and culverts under US 190 on the east. During high tides and coastal storm events, saltwater intrusion is via Salt Bayou from Lake Pontchartrain and through culverts under US 90. It was estimated that during the 1983 flood in a 24-year period, approximately 7,600 cfs flowed over US 190. At that time, water depth over the highway was approximately 1.4 feet. Although specific data are lacking, it is probable that significant quantities of nutrients and sediments entered the marsh during this and other extreme flooding events. These influxes of nutrients probably contribute to the vitality of marsh vegetation for 2 to 3 years after such events. In addition, detrital export from Fritchie Marsh certainly increases during these flushing and freshening periods. The complex as with similar type wetlands serves as refuge, nursery, and spawning area for numerous aquatic, avian, and wildlife species.

TERRESTRIAL RESOURCES

18. The activities of man have affected flood and soil characteristics within the Pearl River Basin. This in turn has influenced plant distribution and the related wildlife communities. The Pearl River flood plain within the study area consists of highly diverse broadleafed deciduous forest (bottom-land hardwoods) interspersed with extensive cypress-tupelo area and in some areas pine islands. This reach of the Pearl River Basin remains in a somewhat natural state due in part to state action. The Louisiana Department of Wildlife and Fisheries (LDWF) began purchase of lands for the Pearl River WMA in 1971. The WMA now totals 32,813 acres.

19. In addition, the Louisiana Legislature has included the entire West Pearl, Holmes Bayou, and Morgan River in the state's Natural and Scenic Rivers System. This inclusion attests to the natural beauty and the biological value of the area.

Vegetative Communities

20. The study area is within the Beech-Sweetgum-Magnolia-Pine-Oak Ecoregion (Bailey, 1976). Habitat types range from an all-age hardwood forest in the northern portion to a cypress-tupelo swamp to fresh, intermediate and brackish marshes in the southern portion. East-west vegetation patterns are somewhat different. According to a study by White (1983), vegetation patterns indicate a distinct west-to-east difference in hydrologic regimes with areas on the

east side of the Basin supporting less flood-tolerant assemblages. To determine the location and extent of vegetation types within the study area, the Vicksburg District conducted a study which involved photointerpretation of 1:12,000 color infrared photographs and field surveys. The forest cover types listed by the Society of American Foresters, Forest Cover Types of the United States and Canada, 1980 Ed., were used for classification of forested wetlands and upland types. Marsh cover types were classified according to those proposed by L. N. Eleuterius, The Marshes of Mississippi, in cooperative Gulf of Mexico Estuarine Inventory and Study, 1973. All terrain features within the study area were classified into 1 of 11 categories. The designation and map unit code boundaries were digitized and the data were then stored in computer files. Plate J-52 presents generalized vegetation patterns within the Slidell portion of the study area based on the digitized unit code boundaries. The total area of each category is presented in Table F-1. Field surveys indicated that most of the forested areas were at some time severely high graded, leaving undesirable and cull trees. The mixed hardwood areas were comprised of water oak, cow oak, obtusa oak, Shumard oak, live oak, bitter pecan, hickory, beech, persimmon, American holly, and magnolia.

21. Sweetgum and blue beech were two other species found in abundance. In the cypress-tupelo swamps, ash and swamp blackgum were also abundant. The overstory varied from moderately open to closed. Understory was generally sparse. Quality of browse species was good, but limited in quantity. Browse species included water oak, red maple, white bay, swamp dogwood, blackgum, Virginia willow, mulberry, wild azalea, blackberry, and smilax. Ground truthing surveys found that areas that appeared to be slash-pine and grassland in some areas supported pitcher plant bog type habitats.

Wildlife Resources

22. Except for urbanized (disturbed) areas, the diverse habitats within the study area support numerous wildlife forms. According to LDWF data, game species within the area include deer, turkey, squirrels, rabbits, waterfowl and woodcock. The large contiguous Pearl River WMA provides refuge for numerous other wildlife species. Specific data on wildlife densities within the immediate study area are limited. However, wildlife coordination efforts indicate that the area hunter success data generally reflect carrying capacities similar to those presented in LDWF report of 1 December 1969, The Vanishing Delta Hardwoods, Their Wildlife Resource. LDWF estimates indicate that on an average, the Pearl River WMA provides approximately 2.4 man-days per acre of wildlife- and fishery-oriented activities including both consumptive and nonconsumptive uses. It must be emphasized that general wildlife

TABLE F-1
LAND USE PROJECTIONS
ALTERNATIVE WITHOUT-PROJECT (NO-ACTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,436	14,871	14,930	14,988	15,046	15,105
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	1,131	663	663	663	663	663
Loblolly Pine-Hardwood	8,241	6,777	4,851	4,792	4,734	4,676	4,617
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	5,337	5,337	5,337	5,337	5,337	5,337
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,778	5,778	5,778	5,778	5,778	5,778
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

densities are not reflective of those within urbanized areas. Urbanization and other manmade changes alter successional patterns and the corresponding wildlife densities.

23. According to Wolfe (1971 and 1980), there are 34 species of nongame mammals in the Pearl River Basin. Breeding Bird Survey (BBS) data conducted by the U. S. Fish and Wildlife Service (FWS) and Christmas Bird Count (CBC) Data, National Audubon Society, show that there are 266 species of nongame birds which occur either as residents or transients in the Pearl River Basin. The CBC over the period of 1976-1979 reported 135 species in Hancock County, Mississippi. Records and surveys show that there is a large mixed breeding colony that has been reported for over 30 years in the marshes and cypress-tupelo swamps near White Kitchen just north of US 90 in St. Tammany Parish. Another apparent heron rookery was located during field reconnaissances within the study area.

ENDANGERED, THREATENED, OR RARE SPECIES

24. According to a study conducted by Dugoni (1980) and by actual field sightings, there is an active bald eagle, a Federally listed endangered species, nesting location and supporting habitat between US 90 and the Doubloon Bayou area.

25. The American alligator, once considered endangered, has recovered to the extent in Louisiana that an annual alligator trapping season is open, usually in September, on a permit basis in the Pearl River WMA.

26. The white fringed orchid (Plantanthea blepheriglotlis) was recorded during field surveys conducted in September 1983. The species was found in a pitcher plant bog in a slash pine area within the study boundaries. This is the first recorded sighting in the State of Louisiana.

EXECUTIVE ORDER 11988 "BASE FLOOD PLAIN"

27. According to the Federal Emergency Management Agency's maps, approximately 70 percent of the study area is currently within what is known as the 100-year flood plain. The 100-year flood plain within the study area is determined by two major controlling factors, headwater floods and hurricane storm surges. From Doubloon Bayou south, the primary controlling factor is

hurricane surge. Executive Order 11988, Flood Plain Management, signed 24 May 1977, emphasizes and requires Federal agencies to recognize the environmental aspects and values of flood plain management. Additionally, the Order requires agencies to consider the public benefits that would be realized from restoring and preserving flood plains. The unified program goal is sound flood plain management that embodies the "wise use, conservation, development, and utilization of interrelated land and water resources to serve objectives of economic efficiency, environmental quality, and social well-being as consonant with responsibilities assigned to respective levels of government by law." The Order's objective is the avoidance, to the extent possible, of long- and short-term adverse impacts associated with the occupancy and modification of the base flood plain and the avoidance of direct and indirect support of development in the base flood plain wherever there is a practicable alternative. According to Corps data, approximately 30 percent of the structures within the project area are below the 100-year flood elevation.

COASTAL ZONE (PUBLIC LAW 92-583, 16 U.S.C. 1451)

28. The Coastal Zone Management Act of 1972 established and recognized that it is a national interest to effectively manage the nation's coastal zones. Within the study area, the coastal zone's inland northern boundary is I-10. The coastal zone is rich in a variety of natural, commercial, recreational, ecological, industrial, and esthetic resources of immediate and potential value to the present and future well-being of the state and nation. Within the enactment of the Louisiana State Coastal Resources Management Act (Act 361) in 1978, the state legislature declared the state's public policy was "to protect, develop, and where feasible, restore or enhance the resources of the state's coastal zone."

RECREATION RESOURCES

29. According to the Louisiana State Comprehensive Outdoor Recreation Plan (SCORP) (1977), the study area is part of Subregion 1B of Region 1 which ranks first in the state in population. Approximately 30 percent of the state population is located in this region. Therefore, the demand for outdoor recreation within the study area is increasing. Currently within the general area there are three state parks, eight public boat-launching facilities, two public camping areas, one state-owned WMA, and three streams listed as natural and scenic by the State of Louisiana.

CULTURAL RESOURCES

30. The National Register of Historic Places criteria for evaluation of significance (36 CFR Part 60.6) of cultural resources are:

> "The quality of significance in American history, architecture, archeology and culture is present in districts, sites, buildings, structures and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history" (36 CFR Part 60.6).

31. It should be noted that certain classes of cultural resources (listed below) are not ordinarily considered eligible for inclusion on the National Register of Historic Places.

a. Cemeteries, birth places, or graves of historic people.

b. Properties primarily of a religious or commemorative nature.

c. Properties that have been moved or reconstructed.

d. Properties that have become significant within the last 50 years.

32. Cultural remains were found or recorded at 19 locations within the surveyed area. Of the 19 recorded sites, 2 dated to the prehistoric period and 17 were historic in origin. The locations of the four previously recorded prehistoric sites were visited during the survey.

Sites Listed on the National Register of Historic Places

33. No sites within the areas surveyed are listed on the National Register of Historic Places nor have any been determined to be eligible.

Potentially Significant Sites

34. Of the sites recorded within the areas surveyed (Table F-2), five (16ST6, 16ST47, 16ST112, NLU-84-133, and NLU-84-148) are believed to be potentially significant; i.e., eligible for inclusion on the National Register of Historic Places.

TABLE F-2
SITE SIGNIFICANCE

Site No.	Description	Potentially Eligible	Not Eligible	Cemetery
16ST6	Prehistoric site	X	-	-
16ST47	Prehistoric site	X	-	-
16ST56/80	Destroyed prehistoric site	-	X	-
16ST57/77	Destroyed prehistoric site	-	X	-
16ST105	Porter Cemetery #1	-	-	X
16ST106	Porter Cemetery #2	-	-	X
16ST107	Rousseaux Cemetery	-	-	X
16ST108	McManus Cemetery	-	-	X
16ST109	Possible historic site	-	X	-
16ST110	Gause Cemetery	-	-	X
16ST111	Historic house site	-	X	-
16ST112	Brick kiln	X	-	-
16ST113	Enoch Talley Cemetery	-	-	X
16ST114	Turpentine cup scatter	-	X	-
X16ST-E	Single grave foot marker	-	-	X
X16ST-F	Isolated prehistoric sherd	-	X	-
X16ST-G	Redeposited prehistoric artifacts	-	X	-
NLU-84-133	Creole-style house	X	-	-
NLU-84-138	Creole-like house	-	X	-
NLU-84-144	Modified 20th Century log house	-	X	-
NLU-84-148	Sunken barge	X	-	-
NLU-84-149	Possible historic grave	-	-	X
NLU-84-152	Possible historic graves	-	-	X

ENVIRONMENTAL EVALUATION

EVALUATION METHODS

35. Three basic evaluation techniques were utilized during the study to determine the environmental impacts that would result from the alternatives presented in the final array. To quantify historical and cultural related impacts, a survey was taken within the project area during July 1984. The results of this survey will be discussed later in this appendix in the Cultural Impact Section. Two other techniques were utilized to quantify other

environmental impacts; the Habitat Evaluation Procedure (HEP) developed by the U. S. Department of Interior, FWS, and a user-day monetary evaluation. These techniques are briefly described in the following paragraphs.

Habitat Evaluation Procedure

36. This procedure (FWS, 1980) is a planning and evaluation technique that focuses on the habitat requirements of fish and wildlife species. The procedure is based on various wildlife species models. The models were developed for various species based on numerous literature sources in an effort to consolidate scientific information on species-habitat relationships. HEP field data were developed for the study area by an interagency team of personnel from the LDWF, FWS, and the Vicksburg District in August 1984.

37. A number of terrestrial species models were initially screened for evaluation purposes. The terrestrial guild evaluation species used for assessment purposes included the raccoon, grey squirrel, and barred owl. The consensus of the HEP team was that these species were representative and related impacts could be extrapolated to the large wildlife community structure. The HEP analysis data are presented in Table F-3. Impacts of the various alternatives were evaluated in terms of change in habitat units (HU's) over the life of the project. Net impacts were obtained by comparing predicted future conditions (available habitat and related model habitat suitability indexes (HSI's)) without project with expected future conditions resulting from the actions. HU impacts were then annualized and are expressed as average annual habitat units (AAHU's).

User-Day/Monetary Evaluation

38. This evaluation technique is based on the annual production and harvest of fish and wildlife species and other nonconsumptive uses. Monetary values for consumptive activities are those referenced in Economic Environmental Principles and Guidelines, EC 1105-2-128, 29 February 1984. Dollar values used for general recreational categories are big game ($19.60); waterfowl ($19.60); small game and general recreation ($4.90); and warmwater sport fishing ($4.80). Evaluation of five suggested criteria indicate that the optimum unit day dollar values are applicable to the study area considering its proximity to the major metropolitan area of New Orleans and the ecological and recreational significance of the Pearl River flood plain wetland complex. Data developed from this evaluation are presented in Table F-4. It should be noted that the value for nonconsumptive recreation in urban areas was derived by the following assumptions.

Nonconsumptive Urban Recreation

39. Due to the urbanized nature of the areas considered for protection, it is perceived that future consumptive use, hunting and trapping, will be restricted to the Pearl River WMA, and therefore, urbanization will negate

TABLE F-3
HABITAT EVALUATION PROCEDURE (HEP)
ALTERNATIVE PLAN IMPACTS

Species	Plan A a/			Plan D			Plan E a/		
	Without Project AAHU's b/	With Project AAHU's	Change	Without Project AAHU's	With Project AAHU's	Change	Without Project AAHU's	With Project AAHU's	Change
Raccoon	959.19	962.4	3.21	2,264.76	2,738.47	473.71	1,855.26	2,261.47	406.22
Grey Squirrel	1,106.55	1,084.18	-22.37	2,799.37	2,842.06	42.68	2,371.91	2,332.83	-39.08
Barred Owl	1,350.54	1,322.86	-27.68	3,532.49	3,733.42	200.93	2,991.60	3,107.53	-115.94

Species	Plan J		
	Without Project AAHU's	With Project AAHU's	Change
Raccoon	2,478.86	2,478.86	0.00
Grey Squirrel	3,114.86	3,081.32	-33.54
Barred Owl	3,932.62	3,924.33	-8.29

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a/ Recommended plan.
b/ Average annual habitat units, see paragraph 37, page F-14.

TABLE F-4
USER-DAY/DOLLAR VALUES
PER ACRE (1984)
BY HABITAT TYPE
SLIDELL-PEARLINGTON STUDY AREA

Habitat/Type	Use								Total Dollar Value
	Small Game		Big Game		Waterfowl		Wildlife-Oriented Recreation		
	Man-Day	Dollars [a]	Man-Day	Dollars [a]	Man-Day	Dollars [a]	Man-Day	Dollars [a]	
Urban	0.0	0.00	0.0	0.00	0.0	0.00	[b]	7.26 [b]	7.26 [b]
Agriculture	0.10	0.49	0.01	0.20	0.05	0.98	0.01	0.05	1.72
Grassland	0.12	0.59	0.01	0.20	0.00	0.00	0.1	0.49	1.28
Forested Lands									
Pine-Hardwoods	0.23	1.13	0.24	4.70	0.00	0.00	0.5	2.45	8.28
Slash Pine	0.12	0.59	0.12	2.35	0.00	0.00	0.5	2.45	5.39
Willow Oak-Water Oak	0.40	1.96	0.52	10.19	0.5	9.80	1.0	4.90	26.85
Wooded Swamps									
Water Tupelo-Swamp Tupelo	0.10	0.49	0.20	3.92	0.5	9.80	1.0	4.90	19.11
Cypress-Tupelo									
Sump	0.10	0.49	0.10	1.96	0.20	3.92	1.0	4.90	11.27

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a/ Current dollar values as reflected by Principles and Guidelines, EC 1105-2-128, 29 February 1984.

b/ See nonconsumptive evaluation, page F-13.

consumptive wildlife hunting values in the general confines of expanded Slidell and Pearlington areas. It is anticipated that according to the Louisiana SCORP and other data that a significant level of nonconsumptive use activity will occur in the urbanized areas. It is projected that probably most of the region's total nonconsumptive use will occur in residential habitat areas. The dollar value per acre was calculated as follows:

a. Approximately $700 million is expended annually in the United States on birdwatching, bird feeding, and wildlife photography, corrected for inflation (DeGraf and Thomas, 1976, and Moore, 1979). There are 80 million U. S. households (U. S. Department of Commerce, 1975); therefore, $6.40 is expended annually per U. S. household.

b. There are 2.2 households per residential acre in the urbanized portions of the study area (1980 Census).

c. According to the 1977 Mississippi SCORP, 51.6 percent of the population participates in some form of nonconsumptive activities ($6.40 per household) (2.2 households) (0.516 participants). Approximately $7.26 is expended annually per acre of residential habitat in Slidell-Pearlington for nonconsumptive wildlife use.

ALTERNATIVES CONSIDERED

40. During the initial screening of the study, various flood control measures were investigated. These measures included nonstructural (floodproofing, zoning, and relocation) and structural options. Only structural measures proved to be economically justified and/or implementable. The structural flood control alternatives include three basic levee alignments--a 4.5-mile alignment north of Interstate 10 (Plan A) and two located south of I-10 (Plans D [approximately 10 miles] and E [approximately 11 miles]). During the formal review of the draft report, an additional 8.4-mile levee alignment (Plan J) was proposed by a local interest group for the area south of I-10. In accordance with the NEPA formal review requirements, Plan J was investigated and is included in this document. The various alignments are depicted on Plates J-11, J-14, J-15, and J-20. Options for each alignment included levee sized for the 100-year, 200-year, and SPF events. Integral components of each levee option are various sized pumping plants, sump (storage) requirements, and floodgate structures. A general description of each plan in the final array and related options are presented in the following sections.

Plan A (North of Interstate 10)

41. Plan A will protect 2,863 acres. The types of existing lands protected and construction requirements are presented in Tables F-5 and F-6.

TABLE F-5
AREA PROTECTED, BY ALTERNATIVE
(Acres)

Land Use	Plan A	Plan D	Plan E	Plan J
Urban	1,575	3,160	2,925	3,861
Agriculture	6	6	5	6
Grassland	93	859	811	905
Pine Hardwood	698	2,822	2,195	3,178
Water Oak-Willow Oak	6	0	0	0
Water-Tupelo	449	530	319	383
Water Bodies	36	125	55	193
Total	2,863	7,502	6,310	8,526 a/

a/ Does not reflect the 6,393-acre Fritchie Marsh complex. Also, Plan J provides protection from Pearl River flooding only. It does not provide protection from hurricane flooding.

42. Each of the three levee size options will include one major floodgate equipped with a 50-cubic-foot-per-second (cfs) pumping plant and eight minor slide gate type structures. The location of the structures are shown on Plate J-11. The 50-cfs pumping plant located on Gum Bayou would require a 485-acre sump (storage area). All borrow materials needed for levee construction would be acquired offsite from commercial pits. A boat-launching ramp landside of the levee on Gum Bayou is included in this plan to provide access for general maintenance of the inlet channel, sump areas, and pump facilities. This ramp will also provide access for the State of Louisiana, Department of Wildlife and Fisheries to continue regular chemical spraying for controlling the growth of water hyacinths on Gum Bayou.

Plan D (South of Interstate 10)

43. Plan D options will protect 7,502 acres of the area located south of I-10. The types of existing lands protected are presented in Table F-5. Construction and operation requirements for the Plan D options are presented in Table F-6. Each of the three levee design options would include a major floodgate structure equipped with a 15-cfs pumping plant (south of Cross Gates Subdivision) and a navigational floodgate with a 250-cfs pumping plant (Doubloon Bayou). In addition, each option would have four minor slide gate drainage structures. The locations of structures are shown on Plate J-14. The 15-cfs pumping plant would require a 270-acre sump (storage) area and the 250-cfs pumping plant would require a 1,440-acre sump. Total sump requirements for Plan D options would be 1,710 acres. All borrow material needed for levee construction would be acquired offsite from commercial pits. Land use requirements for each of the Plan D options are presented in Table F-6.

Plan E (South of Interstate 10)

44. Plan E options will protect 6,310 acres of the area located south of Interstate 10. The types of existing lands protected are presented in Table F-5. Construction and operation requirements for the Plan E options are

TABLE F-6
LAND USE REQUIREMENTS
FLOOD CONTROL ALTERNATIVES
CONSTRUCTION AND OPERATION

Activity/Use	Plan A			Plan D			Plan E			Plan J		
	100-Year	200-Year	SPF	100-Year	200-Year	SPF	100-Year	200-Year	SPF	100-Year	200-Year	SPF
Levee Dimensions												
Length (miles)	4.5	4.5	4.5	9.4	9.7	10.1	10.4	10.5	10.7	8.3	8.4	8.4
Average height (feet)	5.1	5.8	7.3	6.4	6.6	7.4	5.4	5.8	6.6	5.5	6.0	6.8
Average base width (feet) a/	51	58	73	64	66	74	54	58	66	55	60	68
Borrow (cubic yards)	276,200	313,800	428,500	670,700	721,400	901,400	606,100	656,100	832,800	507,416	535,028	655,037
Levee Rights-of-way (acres)												
Urban	21	22	23	31	33	35	26	29	28	26	26	26
Grassland	0	0	0	11	12	9	9	9	6	3	6	3
Pine-Hardwoods	18	18	19	41	46	49	66	70	66	48	50	55
Water Tupelo	21	21	18	24	26	29	8	8	23	10	12	15
Water Bodies	0	0	5	2	2	4	1	1	2	1	1	1
Total	58	61	65	109	119	126	110	117	125	88	95	100
Operation Sump												
Grassland	0	0	0	320	320	320	320	320	320	0	0	0
Pine-Hardwood	0	0	0	778	778	778	638	638	638	82	82	82
Water Tupelo	449	449	449	530	530	530	319	319	319	368	368	368
Open water	36	36	36	82	82	82	12	12	12	78	78	78
Total	485	485	485	1,710	1,710	1,710	1,289	1,289	1,289	528	528	528
Potential Urban Development (acres)	0	0	0	-1,098	-1,098	-1,098	-748	-748	-748	-133	-138	-140
100-Year Flood Plain Modification (acres)	-890	-890	-890	-1,740	-1,740	-1,740	-1,341	-1,341	-1,341	b/	b/	b/

a/ To determine average rights-of-way width for levee; a minimum of 40 feet must be added to the average base width of levee.
b/ Option would remove Fritchie Marsh as a headwater flood storage area.

presented in Table F-6. Each of the levee design would include two major floodgate structures equipped with a 15-cfs pumping plant (south of Cross Gates Subdivision) and a 250-cfs pumping plant (Doubloon Bayou). In addition, each option would have six minor slide gate structures. The location of structures is shown on Plate J-15. The 15-cfs pump would require an 89-acre sump storage area and the 250-cfs pump would require a 1,200-acre sump. Total sump requirements for the Plan E options would be 1,289 acres. All borrow material needed for levee construction would be acquired offsite from existing commercial pits. Land use requirements for each Plan E option are presented in Table F-6. A boat-launching ramp landside of the levee on Doubloon Bayou is included to provide access for general maintenance of the inlet channels, sump areas, and pump facilities.

Plan J (South of Interstate 10)

45. Plan J was designed to protect 8,526 acres of the area located south of Interstate 10. This acreage figure does not include the Fritchie Marsh complex (approximately 6,393 acres). This levee plan was proposed by the Military Road Alliance (MRA) at the April 1985 public meeting as an alternative to Plan E and provides for a line of headwater protection for Interstate 10 to US 90. A detailed evaluation of this plan was not included in the March 1985 Draft Interim Report. The types of existing lands protected are presented in Table F-5. Construction and operation requirements for the Plan J options are presented in Table F-6. Each of the levee design options include a 15-cfs pumping station with a major gravity outlet structure located south of the Cross Gates Subdivision, one major gravity outlet structure on Doubloon Bayou, and nine minor drainage structures. The location of the structures is shown on Plate J-20. The 15-cfs pump would require an 89-acre sump storage area. An additional 439-acre storage area would be required along Doubloon Bayou. Total storage area requirements would be 528 acres. All borrow material needed for levee construction would be acquired offsite from existing upland commercial pits.

ENVIRONMENTAL IMPACTS

GENERAL

46. The construction and operation of any of the alternatives studied in detail would serve to reduce the extent of major headwater flooding events in the Slidell portion of the study area. The related pumping plants would serve to reduce the extent and duration of interior flooding during these events. The reduction in flood hazard could encourage further development in the protected areas. Development within designated sump storage areas would be prohibited, and future development in unprotected areas would be regulated by appropriate local, state, and Federal ordinances and mandates. Floodgate structures will remain open except during major flooding, so as not to impede natural drainage patterns within the study area. Environmental impacts were

evaluated for a 50-year period. It is assumed that any environmental projections for longer periods of time would be nebulous and therefore highly questionable.

NOISE, AIR QUALITY, ENERGY, AND WATER QUALITY

47. Site preparation and construction activities may cause temporary noise impact. The pumping plants would be electrically driven; therefore, operation should be relatively quiet and unobjectionable. Debris from site clearing would contribute a minor degree of temporary air pollution. Construction activities in wetlands and other water areas would have a short-term adverse impact on the water quality in the immediate area. However, these would be minimal when annualized over the life of the project. Further urbanization within the protected areas would increase turbidity and pollution levels from nonpoint sources.

48. Operation of the pumping plant would require energy from electric generating plants driven by fossil fuels or nuclear power. Annual cost of electricity for the Plan A 50-cfs pumping plant would be $11,800. Annual electrical costs for Plan D would be $42,000 for the 250-cfs pumping plant and $3,200 for the 15-cfs pumping plant, a total combined annual electrical cost of $45,200. Combined annual electrical cost for Plan E would be $45,200--$3,200 for the 15-cfs pump and $42,000 for the 250-cfs pump. Annual electrical costs for Plan J would be $3,200 for the 15-cfs pumping plant.

FISHERY RESOURCES

49. Habitat conditions conducive to an abundance of aquatic resources in the area are directly associated with frequency and duration of overflow during the winter and spring months. Seasonal water level fluctuations result in higher productivity and greater harvests of both sport and commercial fishery resources. A reduction in the frequency and duration of major flooding occasioned by the operation of the pumping plant could reduce the food resources for fish provided by the inundation of terrestrial habitat. The reduction in flooding would diminish spawning and nursery areas within the protected areas, but would not severely impact the sport and commercial fishery throughout the larger system of backwater lakes, wetlands, and streams not protected by levees. Annual fishing potential lost in those water areas directly impacted by various levee options is presented in Table F-7 (water bodies) and ranges from $0 to $171.

WETLAND IMPACTS

50. Rights-of-way for levee and pumping plants will directly impact wetland areas and adjacent open water areas in varying degrees. Plan A options would

TABLE F-7
PROJECT FISH AND WILDLIFE IMPACT ANALYSIS OF ANNUALIZED DOLLAR UNITS BY ALTERNATIVE

Alternative	Land Use	Future With Project	Future Without Project	Changes in Dollar Units
Plan A (100-Year Option)	Urban	103,623.23	103,675.18	- 51.95
	Agriculture	342.61	342.61	0.00
	Grassland	1,080.98	1,011.86	69.12
	Pine-Hardwoods	43,682.57	43,908.55	- 225.99
	Wooded Swamp	93,894.68	101,990.07	- 8,095.39
	Water Bodies	212,630.40	212,630.40	0.00
	Sump	4,931.60	0.00	4,931.60
	Subtotal			- 3,372.61
Plan A (200-Year Option)	Urban	103,610.97	103,675.18	- 64.21
	Agriculture	342.61	342.61	0.00
	Grassland	1,084.56	1,011.86	72.70
	Pine-Hardwoods	43,674.86	43,908.55	- 233.69
	Wooded Swamp	93,894.68	101,990.07	- 8,095.39
	Water Bodies	212,630.40	212,630.40	0.00
	Sump	4,931.60	0.00	4,931.60
	Subtotal			- 3,388.99
Plan A (SPF Option)	Urban	103,604.21	103,675.18	- 70.97
	Agriculture	342.61	342.61	0.00
	Grassland	1,089.32	1,011.86	77.46
	Pine-Hardwoods	43,665.72	43,908.55	- 242.83
	Wooded Swamp	93,948.05	101,990.07	- 8,042.02
	Water Bodies	212,459.09	212,630.40	- 171.31
	Sump	4,931.60	0.00	4,931.60
	Subtotal			- 3,518.07
Plan D (100-Year Option)	Urban	97,630.10	103,675.18	- 6,045.08
	Agriculture	342.61	342.61	0.00
	Grassland	1,065.09	1,011.86	53.23
	Pine-Hardwoods	42,194.59	43,908.55	- 1,713.96
	Wooded Swamp	93,918.40	101,990.07	- 8,071.67
	Water Bodies	212,561.88	212,630.40	- 68.52
	Sump	17,082.21	0.00	17,082.21
	Subtotal			+ 1,236.21
Plan D (200-Year Option)	Urban	97,616.58	103,675.18	- 6,058.60
	Agriculture	342.61	342.61	0.00
	Grassland	1,075.82	1,011.86	63.96
	Pine-Hardwoods	42,156.05	43,908.55	- 1,752.50
	Wooded Swamp	92,097.68	101,990.07	- 9,892.39
	Water Bodies	212,561.88	212,630.40	- 68.52
	Sump	17,082.21	0.00	17,082.21
	Subtotal			- 625.85

TABLE F-7 (Cont)

Alternative	Land Use	Future With Project	Future Without Project	Changes In Dollar Units
Plan D (SPF Option)	Urban	97,619.96	103,675.18	- 6,055.22
	Agriculture	342.61	342.61	0.00
	Grassland	1,084.76	1,011.86	72.90
	Pine-Hardwoods	42,132.92	43,908.55	- 1,775.63
	Wooded Swamp	92,044.30	101,990.07	- 9,945.77
	Water Bodies	212,493.35	212,630.40	- 137.05
	Sump	17,082.21	0.00	17,082.21
	Subtotal			- 758.56
Plan E (100-Year Option)	Urban	99,353.73	103,675.18	- 4,321.45
	Agriculture	342.61	342.61	0.00
	Grassland	1,068.67	1,011.86	56.81
	Pine-Hardwoods	41,153.88	43,908.55	- 2,754.67
	Wooded Swamp	96,172.06	101,990.07	- 5,818.01
	Water Bodies	212,596.14	212,630.40	- 34.26
	Sump	13,525.17	0.00	13,525.17
	Subtotal			+ 653.59
Plan E (200-Year Option)	Urban	99,334.70	103,675.18	- 4,340.48
	Agriculture	342.61	342.61	0.00
	Grassland	1,077.01	1,011.86	65.15
	Pine-Hardwoods	41,123.05	43,908.55	- 2,785.51
	Wooded Swamp	96,172.06	101,990.07	- 5,818.01
	Water Bodies	212,596.14	212,630.40	- 34.26
	Sump	13,525.17	0.00	13,525.17
	Subtotal			+ 612.06
Plan E (SPF Option)	Urban	99,340.21	103,675.18	- 4,334.97
	Agriculture	342.61	342.61	0.00
	Grassland	1,090.12	1,011.86	78.26
	Pine-Hardwoods	41,153.88	43,908.55	- 2,754.67
	Wooded Swamp	95,905.18	101,990.07	- 6,084.89
	Water Bodies	212,561.88	212,630.40	- 68.52
	Sump	13,525.17	0.00	13,525.17
	Subtotal			+ 360.38

TABLE F-7 (Cont)

Alternative	Land Use	Future With Project	Future Without Project	Changes in Dollar Units
Plan J (100-Year Option)	Urban	103,500.69	103,675.18	-174.49
	Agriculture	342.61	342.61	0.00
	Grassland	1,113.16	1,011.86	101.30
	Pine-Hardwoods	43,538.52	43,908.55	-370.03
	Wooded Swamp	95,264.67	101,990.07	-6,725.40
	Water Bodies	212,596.14	212,630.40	-34.26
	Sump	3,861.34	0.00	3,861.34
	Subtotal			-3,341.55
Plan J (200-Year Option)	Urban	103,500.69	103,675.18	-174.49
	Agriculture	342.61	342.61	0.00
	Grassland	1,117.93	1,011.86	106.06
	Pine-Hardwoods	43,523.11	43,908.55	-385.45
	Wooded Swamp	95,229.08	101,990.07	-6,760.99
	Water Bodies	212,596.14	212,630.40	-34.26
	Sump	3,861.34	0.00	3,861.34
	Subtotal			-3,387.79
Plan J (SPF Option)	Urban	103,500.69	103,675.18	-174.49
	Agriculture	342.61	342.61	0.00
	Grassland	1,127.46	1,011.86	115.60
	Pine-Hardwoods	43,484.56	43,908.55	-423.99
	Wooded Swamp	95,175.71	101,990.07	-6,814.36
	Water Bodies	212,596.14	212,630.40	-34.26
	Sump	3,861.34	0.00	3,861.34
	Subtotal			-3,470.16

convert 21 acres of water tupelo-swamp tupelo for 100-year, 21 acres for 200-year, and 23 acres for the SPF designed options. Further development would be prohibited in the 485 acres of wetlands required for sump storage. Plan D options would convert 24, 26, and 29 acres of water tupelo-swamp tupelo for the 100-year, 200-year, and SPF event, respectively. Development in the 1,710-acre flood-prone sump area would be prohibited. Plan E options were designed to avoid major wetlands where possible. The Plan E 100- and 200-year options would only directly impact 8 acres of wetlands. The SPF option for Plan E would impact 23 acres. Development in the 1,289-acre low-lying sump storage areas would be prohibited. However, the potential exists for direct impact on peripheral and supportive habitat adjacent to the major wetlands inside the various levee alignments, should the existing 100-year base flood plain be altered. If this condition occurs, the likelihood of these areas being converted to residential areas would be greatly increased. The removal of those supportive or "buffer" habitats would tend to degrade the quality of the existing wetlands. Removal of this vegetation would eliminate the filtering effect with regard to incoming turbidity and other nonpoint source pollutants. Increased turbidity would result in long-term impacts of siltation deposition, with the associated impacts of shortening the expected longevity of these wetlands. Plan J options as proposed by local interests would convert 10, 12, and 15 acres of water tupelo-swamp tupelo for the 100-year, 200-year, and SPF levee designs, respectively. In addition to those areas directly impacted by levee construction, possible adverse secondary impacts to the Fritchie Marsh complex could result from the elimination of the sheetflow of nutrient-rich sediment-laden water during the major flooding events.

51. Reduced flooding over time presents the likelihood of altering vegetative species composition in situations where flooding is reduced sufficiently to alter the water regime. These changes would have long-term impacts and the immediate effects would not be discernible. Quantification of these types of impacts cannot be easily determined, but must be reiterated when considering the possibility of flood control implementation.

TERRESTRIAL AND WILDLIFE RESOURCES

52. Levee rights-of-way and operation of the various alternatives will impact other land use categories in addition to wetlands. The various land use changes associated for each alternative are presented in Tables F-8 through F-16.

53. The impacts of rights-of-way clearing, reduced flooding, and further urbanization would reduce the extent and productivity of habitat essential for the survival and propagation of many wildlife forms. Conversion of wooded areas to cleared urbanized area will eliminate consumptive wildlife uses in those areas. Continued urbanization and loss of hunting along the periphery of the Pearl River WMA will aggravate competition for hunting in the WMA.

TABLE F-8
LAND USE PROJECTIONS
ALTERNATIVE PLAN A (100-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,416	14,865	14,925	14,983	15,041	15,100
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	1,189	721	721	721	721	721
Loblolly Pine-Hardwood	8,241	6,760	4,820	4,760	4,702	4,644	4,585
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,867	4,867	4,867	4,867	4,867	4,867
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,742	5,742	5,742	5,742	5,742	5,742
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump Area	0	485 a/	485 a/	485 a/	485 a/	485 a/	485 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 36 acres of open water.

TABLE F-9
LAND USE PROJECTIONS
ALTERNATIVE PLAN A (200-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,414	14,864	14,923	14,981	15,039	15,098
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	1,192	724	724	724	724	724
Loblolly Pine-Hardwood	8,241	6,759	4,818	4,759	4,701	4,643	4,584
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,867	4,867	4,867	4,867	4,867	4,867
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,742	5,742	5,742	5,742	5,742	5,742
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	485 [a]	485 [a]	485 [a]	485 [a]	485 [a]	485 [a]
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

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[a] Includes 36 acres of open water.

TABLE F-10
LAND USE PROJECTIONS
ALTERNATIVE PLAN A (SPF OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,413	14,863	14,922	14,980	15,038	15,097
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	1,196	728	728	728	728	728
Loblolly Pine-Hardwood	8,241	6,758	4,817	4,758	4,700	4,642	4,583
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,870	4,870	4,870	4,870	4,870	4,870
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,737	5,737	5,737	5,737	5,737	5,737
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	485 a/	485 a/	485 a/	485 a/	485 a/	485 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 36 acres of open water.

TABLE F-11
LAND USE PROJECTIONS
ALTERNATIVE PLAN D (100-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,405	13,804	13,863	13,921	13,979	14,038
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	909	761	761	761	761	761
Loblolly Pine-Hardwood	8,241	5,958	4,748	4,689	4,631	4,573	4,514
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,783	4,783	4,783	4,783	4,783	4,783
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,694	5,694	5,694	5,694	5,694	5,694
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 82 acres of open water.

TABLE F-12
LAND USE PROJECTIONS
ALTERNATIVE PLAN D (200-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,403	13,802	13,861	13,919	13,977	14,036
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	918	770	770	770	770	770
Loblolly Pine-Hardwood	8,241	5,953	4,743	4,684	4,626	4,568	4,509
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,781	4,781	4,781	4,781	4,781	4,781
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,694	5,694	5,694	5,694	5,694	5,694
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 82 acres of open water.

TABLE F-13
LAND USE PROJECTIONS
ALTERNATIVE PLAN D (SPF OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,401	13,803	13,862	13,920	13,978	14,037
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	928	777	777	777	777	777
Loblolly Pine-Hardwood	8,241	5,950	4,740	4,681	4,623	4,565	4,506
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,778	4,778	4,778	4,778	4,778	4,778
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,692	5,692	5,692	5,692	5,692	5,692
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/	1,710 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 82 acres of open water.

TABLE F-14
LAND USE PROJECTIONS
ALTERNATIVE PLAN E (100-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,410	14,109	14,168	14,226	14,284	14,343
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	912	764	764	764	764	764
Loblolly Pine-Hardwood	8,241	6,073	4,563	4,504	4,446	4,388	4,329
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	5,010	5,010	5,010	5,010	5,010	5,010
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,765	5,765	5,765	5,765	5,765	5,765
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 12 acres of open water.

TABLE F-15
LAND USE PROJECTIONS
ALTERNATIVE PLAN E (200-YEAR OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,407	14,106	14,165	14,223	14,281	14,340
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	919	771	771	771	771	771
Loblolly Pine-Hardwood	8,241	6,069	4,559	4,500	4,442	4,384	4,325
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	5,010	5,010	5,010	5,010	5,010	5,010
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,765	5,765	5,765	5,765	5,765	5,765
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

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a/ Includes 12 acres of open water.

TABLE F-16
LAND USE PROJECTIONS
ALTERNATIVE PLAN E (SPF OPTION)

Land Use	Base Year 1984	Year 1 1992	Year 10 2002	Year 20 2012	Year 30 2022	Year 40 2032	Year 50 2042
Urban	10,615	12,408	14,107	14,166	14,224	14,282	14,341
Agriculture	258	229	188	188	188	188	188
Grassland	1,459	930	782	782	782	782	782
Loblolly Pine-Hardwood	8,241	6,073	4,563	4,504	4,446	4,388	4,329
Slash Pine	523	523	523	523	523	523	523
Willow Oak-Water Oak-Diamond Oak	11,120	11,120	11,120	11,120	11,120	11,120	11,120
Water Tupelo-Swamp Tupelo	5,337	4,995	4,995	4,995	4,995	4,995	4,995
Cypress-Tupelo	11,138	11,138	11,138	11,138	11,138	11,138	11,138
Water Bodies	5,778	5,764	5,764	5,764	5,764	5,764	5,764
Fresh Marsh	3,510	3,510	3,510	3,510	3,510	3,510	3,510
Intermediate Marsh	4,679	4,679	4,679	4,679	4,679	4,679	4,679
Brackish Marsh	2,342	2,342	2,342	2,342	2,342	2,342	2,342
Sump	0	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/	1,289 a/
Total	65,000	65,000	65,000	65,000	65,000	65,000	65,000

a/ Includes 12 acres of open water.

54. The user-day monetary impacts of the various alternatives are presented in Table F-7.

55. The HEP analysis data presented in Table F-3 indicate that the Plan A options would result in the direct loss of approximately 28 AAHU's for barred owl, 22 AAHU's for grey squirrel, and a gain of approximately 3 AAHU's for raccoon. The Plan D options would result in overall gains in AAHU's for all of the indicator species. Plan E options would result in overall AAHU gains for raccoon and barred owl, but would produce a loss of 39 AAHU's for grey squirrel. The Plan J options would result in the direct loss of approximately 34 AAHU's for grey squirrel and 8 AAHU's for barred owl. The general overall gains for Plans D and E were attributed to the preservation of much larger areas of important terrestrial habitat by zoning restrictions within the large project-related sump areas. Based on these findings, FWS has indicated that if the tentatively selected alternative (Plans A and E, 200-year design) is implemented (see Appendix G), no further compensation (mitigation) would be required.

56. Environmental measures considered during the formulation of the alternatives to reduce fish and wildlife impacts included siting levee rights-of-way in upland and cleared areas where possible; avoidance of marsh areas; minimizing impacts on cypress-tupelo wetlands; and where possible, locating structures so not to impede natural drainage. Additionally, it was proposed that floodgates be allowed to remain open except during flood stages to allow normal water exchange to and from the West Pearl River, and that borrow materials be acquired offsite from existing upland commercial pits.

ENDANGERED SPECIES

57. Original coordination with the FWS, Endangered Species Office (see Attachment 1, Appendix F), indicated there would be no impact to any endangered, threatened, or proposed species or their critical habitat. However, coordination related to the proposed Plan J indicated that if Plan J were recommended, Section 7 consultation would be required (see Attachment 1A, Appendix F).

FISH AND WILDLIFE COORDINATION ACT

58. In accordance with the Fish and Wildlife Coordination Act (FWCA), as amended, USC 661, et seq., the study related activities have been closely coordinated with input from appropriate state and Federal fish and wildlife agencies. The FWCA report has been submitted by the FWS (see Appendix G). FWS's recommendations are presented in Appendix G, pages G-11 and G-12.

EXECUTIVE ORDER 11988
"FLOOD PLAIN IMPACT"

59. Implementation of any of the alternatives would alter the recognized 100-year base flood plain. Plan A would remove 890 acres of flood storage area, an approximate 2 percent reduction of the 100-year base flood plain within the Slidell-Pearlington study area. Plan D would remove 1,740 acres, an approximate 4 percent reduction. Plan E would remove 1,341 acres, an approximate 3 percent reduction. When considering the size and extent, 4.5-mile-wide flood plain, these reductions would appear to be insignificant. However, considering historical land use trends, it must be noted that without strenuous enforcement and strengthening of existing flood plain ordinances and regulations, the potential exists for further encroachment into and reduction of the base flood plain. Cumulative "piecemeal" reductions could significantly alter the natural flood storage capabilities and other related biological functions of these Federally mandated and nationally recognized significant areas. Plan J as proposed would eliminate the flow of floodwaters from the West Pearl River into Fritchie Marsh during major headwater flooding events, resulting in the loss of headwater flood storage.

COASTAL ZONE MANAGEMENT

60. Coordination efforts indicated that those study areas south of I-10 are within the Louisiana Coastal Zone Management (CZM) area. In light of this information, a coastal zone consistency determination was completed in accordance with Section 307 of the CZM Act of 1972, 16 U.S.C. 1451 et. seq. and the State of Louisiana Coastal Resources Program (see Attachment 2, Appendix F). The consistency determination is for that portion of the impacted area within CZM jurisdiction (Plan E, 200-year).

RECREATION RESOURCES

61. A 56-foot-wide navigational floodgate was evaluated on Doubloon Bayou for Plan D to provide boat passage via Doubloon Bayou to the West Pearl River. Due to the active water-oriented recreational interests within the project area, this feature was considered to be an integral part of this alternative.

CULTURAL RESOURCES

62. No sites listed on the National Register or any potentially eligible sites would be impacted by the various alternatives. However, four cemeteries and two possible historic graves could be impacted by levee rights-of-way and construction activities. When the exact levee alignments are established during the detailed engineering and design studies, every attempt will be made to avoid impacting these cemeteries. If this is not possible, a recovery program will be initiated or the entire site will be relocated. Additional surveys will also be required during advanced engineering and design phases to ensure that all potential sites within the immediate areas which were not surveyed are investigated.

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ATTACHMENTS 1 AND 1A
APPENDIX F

ENDANGERED SPECIES CORRESPONDENCE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
JACKSON MALL OFFICE CENTER
300 WOODROW WILSON AVENUE, SUITE 3185
JACKSON, MISSISSIPPI 39213

March 19, 1984

IN REPLY REFER TO:
Log No. 4-3-84-160

Colonel Dennis J. York
U.S. Army, Corps of Engineers
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel York:

This responds to your letter of February 29, 1984, concerning various flood control measures for the Slidell, Louisiana/Pearlington, Mississippi, study area. We have reviewed the information you enclosed relative to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Our records indicate no endangered, threatened or proposed species, or their critical habitat occurring in the project area. Therefore, no further endangered species consultation will be required for this project, as currently described.

If you anticipate any changes in the scope or location of this project, please contact our office, telephone 601/960-4900, for further coordination.

We appreciate your participation in the efforts to enhance the existence of endangered species.

Sincerely yours,

Dennis B. Jordan

Dennis B. Jordan
Field Supervisor
Endangered Species Field Office

cc: Department of Wildlife & Fisheries, New Orleans, LA
ES, FWS, Vicksburg, MS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
JACKSON MALL OFFICE CENTER
300 WOODROW WILSON AVENUE, SUITE XXXX 316
JACKSON, MISSISSIPPI 39213

May 22, 1985

IN REPLY REFER TO:
Log No. 4-3-84-160

Colonel Dennis J. York
District Engineer
U.S. Army, Corps of Engineers
Post Office Box 60
Vicksburg, MS 39180-0060

Dear Colonel York:

This responds to your letter of May 13, 1985, regarding Alternative J of the Slidell, Louisiana, and Pearlington, Mississippi, flood control study. We have reviewed the information you enclosed relative to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

As you have indicated in your letter of May 13, 1985, the bald eagle (Haliaeetus leucocephalus) is an endangered species which occurs in the vicinity of the proposed project. There are no proposed species or areas listed as critical habitat in the project vicinity.

If you determine this project to be a major Federal action significantly affecting the quality of the human environment (i.e., one requiring an environmental impact statement), Section 7(c) of the Endangered Species Act, as amended, requires that you prepare a biological assessment to determine the effects of the project on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated and before any physical modification of the environment is begun. If the biological assessment is not begun within 90 days, you should verify the species list informally (via phone) prior to initiation of your assessment. When conducting a biological assessment, you shall, at a minimum:

1. conduct a scientifically sound on-site inspection of the area affected by the action, which must include a detailed survey of the area to determine if listed or proposed species are present or occur seasonally and whether suitable habitat exists within the area for either expanding the existing population or potential reintroduction of populations;

2. interview recognized experts on the species at issue, including those within the Fish & Wildlife Service, the National Marine Fisheries Service, state conservation agencies, universities, and others who may have data not yet found in scientific literature;

3. review literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements;

4. analyze the effects of the action on individuals and populations of each species and its habitat, including cumulative effects of the action;

5. analyze alternative sections that may provide conservation measures;

6. conduct any studies necessary to fulfill the requirements of (1) through (5) above;

7. review any other relevant information.

If you determine that the proposed action may affect any of the listed species or critical habitats, you must request in writing formal consultation pursuant to Section 7(a) from our office. Section 7 requirements also apply to proposed species and proposed critical habitat.

If you determine this action not to be one requiring an environmental impact statement, a biological assessment is not required; however, you still have an obligation to review the activity to determine if it may affect listed species or critical habitat and to initiate formal consultation if you find that such an effect may occur.

If you require further information regarding this project, please contact our office, telephone 601/960-4900.

We appreciate your participation in the efforts to enhance the existence of endangered species.

Sincerely yours,

for Dennis B. Jordan
Field Supervisor
Endangered Species Field Office

cc: RD, FWS, Atlanta, GA (AFA/SE)
ES, FWS, Vicksburg, MS
Department of Wildlife & Fisheries, New Orleans, LA

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

ATTACHMENT 2

LOUISIANA COASTAL ZONE MANAGEMENT PROGRAM CONSISTENCY DETERMINATION

INTRODUCTION

Section 307 of the Coastal Zone Management Act of 1972, 16 U.S.C. 1451 et. seq. requires that "each Federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs." In accordance with Section 307, a consistency determination has been made for the interim report on flood control for the Slidell, Louisiana, study area. Coastal use guidelines were written in order to implement the policies and goals of the Louisiana Coastal Resource Program and serve as a set of performance standards for evaluating projects. Compliance with the Louisiana Coastal Resources Program and therefore Section 307 requires compliance with applicable coastal use guidelines. This consistency determination is for those areas impacted by the recommended plan that are within the designated Coastal Zone, Reach 2, Plan E.

PROJECT DESCRIPTION

The proposed action is to provide headwater flood protection (200-year) for existing development within the study area (see Plate J-22). The recommended plan is a 15-mile-long levee system located approximately 1.5 miles east of Slidell, Louisiana, adjacent to and within the West Pearl River flood plain. The system would extend from Morgan's Bluff north of I-10 to south of Belle Acres Subdivision (Highway 190). The major features of the levee system include a 4.5-mile levee (Reach 1-Plan A) north of I-10 and a 10.5-mile levee (Reach 2-Plan E) south of I-10. Three pumping stations with major floodgate structures and 14 minor slide gate control structures are integral parts of the levee system. Reach 2 (Plan E) is within the designated Louisiana Coastal Zone boundary. Reach 2 includes a 15-cubic-foot-per-second (cfs) pumping station with a 5- by 5-foot floodgate located south of the Cross Gates Subdivision, a 250-cfs pumping station with a double 7- by 8-foot floodgate on Doubloon Bayou, and six minor structures. Approximately 1,289 acres of sump storage would be required south of I-10, 89 acres at the 15-cfs station and 1,200 acres at the 250-cfs station. The Reach 2 levee would have an average base width of 58 feet, an average height of 5.8 feet, and a maximum height of 16 feet. Approximately 656,100 cubic yards of borrow material would be acquired offsite from commercial upland sources for levee construction in floodgate structures within Reach 2 would require the excavation of approximately 780,000 cubic yards of material. The excavated material, if suitable, would be used for construction levee fill. Reach 2 would transverse .56 mile of water tupelo-swamp tupelo wetland area south of I-10. Levee construction south of I-10 would result in the direct loss of 8 acres of this wetland type. Development would be prohibited within the 1,289-acre flood-prone sump area located south of I-10. In addition, floodgate closure and pumping would be initiated only when stages on the West Pearl River exceed interior ponding stages. Pumping would be initiated inside the Doubloon Bayou sump when the water level exceeded 2.6 feet, National Geodetic Vertical Datum (NGVD).

GUIDELINES

1.0 GUIDELINES APPLICABLE TO ALL USES

Guideline 1.1: The guidelines must be read in their entirety. Any proposed use may be subject to the requirements of more than one guideline or section of guidelines and all applicable guidelines must be complied with.

Response 1.1: Acknowledged.

Guideline 1.2: Conformance with applicable water and air quality laws, standards, and regulations, and with those other laws, standards, and regulations which have been incorporated into the coastal resources program shall be deemed in conformance with the program except to the extent that these guidelines would impose additional requirements.

Response 1.2: Acknowledged.

Guideline 1.3: The guidelines include both general provisions applicable to all uses and specific provisions applicable only to certain types of uses. The general guidelines apply in all situations. The specific guidelines apply only to the situations they address. Specific and general guidelines should be interpreted to be consistent with each other. In the event there is an inconsistency, the specific should prevail.

Response 1.3: Acknowledged.

Guideline 1.4: These guidelines are not intended to nor shall they be interpreted so as to result in an involuntary acquisition or taking of property.

Response 1.4: Acknowledged.

Guideline 1.5: No use or activity shall be carried out or conducted in such a manner as to constitute a violation of these terms of a grant or donation of any lands or water bottoms to the state or any subdivision thereof. Revocations of such grants and donations shall be avoided.

Response 1.5: Acknowledged.

Guideline 1.6: Information regarding the following general factors shall be utilized by the permitting authority in evaluating whether the proposed use is in compliance with the guidelines.

Response 1.6: Acknowledged.

Guideline 1.7: It is the policy of the coastal resources program to avoid the following adverse impacts. To this end, all uses and activities shall be planned, sited, designed, constructed, operated and maintained to avoid to the maximum extent practicable significant: •

Guideline 1.7(a): Reductions in the natural supply of sediment and nutrients to the coastal system by alteration of freshwater flow.

Response 1.7(a): The drainage structures will be sited and operated to minimize alterations of freshwater flow. Operation will prevent backwater flooding only and will not reduce total runoff. The structures will be closed only during major flood stages, allowing normal drainage to continue at other times.

Guideline 1.7(b): Adverse economic impacts on the locality of the use and affected governmental bodies.

Response 1.7(b): The Slidell area has major flooding problems with existing annual flood damages exceeding $1.6 million. The majority of these damages occur to residential development. Therefore, flood reductions resulting from the project would have significant beneficial economic impacts for the locality.

Guideline 1.7(c): Detrimental discharges of inorganic nutrient compounds into coastal waters.

Response 1.7(c): Minimal quantities of nutrients would be released during the construction of the 10.5-mile levee system south of I-10, but no long-term project-related increases are expected.

Guideline 1.7(d): Alteration in the natural concentration of oxygen in coastal waters.

Response 1.7(d): There should be no appreciable change in DO levels in the West Pearl River; there may be lower DO levels in Doubloon Bayou during construction. Reductions will be short term, localized, and occur only during construction periods.

Guideline 1.7(e): Destruction or adverse alterations of streams, wetlands, tidal passes, inshore waters and water bottoms, beaches, dunes, barrier islands, and other natural biologically valuable areas or protective coastal features.

Response 1.7(e): Of the 117 acres required to construct the levee system south of I-10, 8 acres are wooded swamp (water tupelo-swamp tupelo). The levees were sited to the maximum extent practicable to avoid wetland areas.

Guideline 1.7(f): Adverse disruption of existing social patterns.

Response 1.7(f): The project would have no significant impacts on existing social patterns and could actually help maintain those in the Slidell area.

Guideline 1.7(g): Alterations of the natural temperature regime of coastal waters.

Response 1.7(g): Increased turbidity could result in slightly raised water temperatures during construction. The effect would be very localized temporary in nature and would not significantly impact the temperature regime.

Guideline 1.7(h): Detrimental changes in existing salinity regimes.

Response 1.7(h): Although the project area is in a coastal region, no salinity gradient exists at the project site.

Guideline 1.7(i): Detrimental changes in littoral and sediment transport processes.

Response 1.7(i): The recommended plan would have minimal impacts on sediment transport.

Guideline 1.7(j): Adverse effects of cumulative impacts.

Response 1.7(j): Use of the site is not expected to have any significant cumulative impacts.

Guideline 1.7(k): Detrimental discharges of suspended solids into coastal waters including turbidity resulting from dredging.

Response 1.7(k): Excavation for control structures would release suspended solids; however, these discharges would be of short-term duration during project construction, and at levels which would not be detrimental to the overall coastal waters.

Guideline 1.7(l): Reductions or blockage of water flow or natural circulation patterns within or into an estuarine system or a wetland forest.

Response 1.7(l): Construction of the levees and drainage structures will modify flow patterns by obstructing flow during the initiation of flooding and evacuation of floodflow to a minor extent. It has been determined that approximately 70 percent of the study area is classified as being within the 100-year base flood plain. Construction of the levee protection system south of I-10 would only alter flood plain storage by approximately 3 percent during major flooding events.

Guideline 1.7(m): Discharges of pathogens or toxic substances into coastal waters.

Response 1.7(m): Pathogenic organisms or toxic substances are not known to be prevalent in the impact area.

Guideline 1.7(n): Adverse alteration or destruction of archeological, historical, or other cultural resources.

Response 1.7(n): No impacts are anticipated on these resources. A cultural resources survey has been completed and no listed National Register sites would be impacted within the direct construction right-of-way for the proposed action.

Guideline 1.7(o): Fostering of detrimental secondary impacts in undisturbed or biologically highly productive wetland areas.

Response 1.7(o): No significant secondary impacts are anticipated. The wetlands within the protected areas would be part of the project-related sump storage area. Project-related zoning would prohibit further development within these areas.

Guideline 1.7(p): Adverse alteration or destruction of valuable habitats, critical habitat for endangered species, important wildlife or fishery breeding or nursery areas, designated wildlife management or sanctuary areas, or forest land.

Response 1.7(p): None of the above would be significantly affected.

Guideline 1.7(q): Adverse alteration or destruction of public parks, shoreline, access points, public works, designated recreation areas, scenic rivers, or other areas of public use and concern.

Response 1.7(q): The levees and control structure on Doubloon Bayou would block access into Doubloon from the Pearl River, but the boat-launching facilities to be constructed landside of the control structure would provide access for general maintenance of inlet channels, sump areas, and pump facilities. This boat-launching ramp will also provide access needed by the State of Louisiana, Department of Wildlife and Fisheries, to continue regular chemical spraying for controlling the growth of water hyacinths in Doubloon Bayou. The West Pearl River classified as natural and scenic will not be impacted by the recommended action.

Guideline 1.7(r): Adverse disruptions of coastal wildlife and fishery migratory patterns.

Response 1.7(r): The project would not disrupt any significant wildlife or fishery migratory patterns.

Guideline 1.7(s): Land loss, erosion and subsidence.

Response 1.7(s): Except for the lands required for project construction flood control measures will not appreciably alter land loss, erosion and subsidence.

Guideline 1.7(t): Increases in the potential for flood, hurricane or other storm damage or increases in the likelihood that damage will occur from such hazards.

Response 1.7(t): The flood control project would decrease flooding potential and related damages within the protected areas.

Guideline 1.7(u): Reductions in the long-term biological productivity of the coastal ecosystem.

Response 1.7(u): There would be no long-term reduction. Preservation of the project-related sump storage area could contribute positively to the coastal ecosystem's long-term biological productivity.

Guideline 1.8: In those guidelines in which the modifier "maximum extent practicable" is used, the proposed use is in compliance with the guideline if the standard modified by the term is complied with. If the modified standard is not complied with, the use will be in compliance with the guideline if the permitting authority finds, after a systematic consideration of all pertinent information regarding the use, the site, and the impacts of the use as set forth in Guideline 1.6, and a balancing of their relative significance, that the benefits resulting from the proposed use would clearly outweigh the adverse impacts resulting from noncompliance with the modified standard and there are no feasible and practical alternative locations, methods, and practices for the use that are in compliance with the modified standard and:

a. Significant public benefits will result from the use, or;

b. The use would serve important regional, state or national interests, including the national interest in resources and the siting of facilities in the coastal zone identified in the coastal resources program, or;

c. The use is coastal water dependent.

Response 1.8: Acknowledged.

Guideline 1.9: Uses shall, to the maximum extent practicable, be designed and carried out to permit multiple concurrent uses which are appropriate for the location and to avoid unnecessary conflicts with other uses of the vicinity.

Response 1.9: Acknowledged.

Guideline 1.10: These guidelines are not intended to be, nor shall they be, interpreted to allow expansion of governmental authority beyond that established by LA R. S. 49:213.1 through 213.21, as amended; nor shall these guidelines be interpreted so as to require permits for specific uses legally commenced or established prior to the effective date of the coastal use permit program nor to normal maintenance or repair of such uses.

Response 1.10: Acknowledged.

2.0 GUIDELINES FOR LEVEES

Guideline 2.1: The leveeing of unmodified or biologically productive wetlands shall be avoided to the maximum extent practicable.

Response 2.1: The recommended plan was sited to the maximum extent practicable to avoid wetlands. Levee construction rights-of-way will directly impact 8 acres of water tupelo-swamp tupelo wetlands. Approximately 331 acres of water tupelo-swamp tupelo wetlands landside of the proposed levee will be part of the project-related 1,289-acre sump area and will be zoned to prohibit further urban encroachment and development.

Guideline 2.2: Levees shall be planned and sited to avoid segmentation of wetland areas and systems to the maximum extent practicable.

Response 2.2: The levees were planned and sited to the maximum extent practicable to avoid the large contiguous West Pearl River wetland complex and the Fritchie Marsh complex.

Guideline 2.3: Levees constructed for the purpose of developing or otherwise changing the use of a wetland area shall be avoided to the maximum extent practicable.

Response 2.3: The levee system would be constructed to protect only existing development, and sump area zoning will prohibit further development within the flood-prone sump areas.

Guideline 2.4: Hurricane and flood protection levees shall be located at the nonwetland/wetland interface or landward to the maximum extent practicable.

Response 2.4: The flood protection levees would be located to the maximum extent practicable at the nonwetland/wetland interface or landward.

Guideline 2.5: Impoundment levees shall only be constructed in wetland areas as part of approved water or marsh management projects or to prevent release of pollutants.

Response 2.5: The proposed levees are designed for headwater and hurricane flood protection, not for impoundment.

Guideline 2.6: Hurricane or flood protection levee systems shall be designed, built and thereafter operated and maintained utilizing best practical techniques to minimize disruptions of existing hydrologic patterns, and the interchange of water, beneficial nutrients and aquatic organisms between enclosed wetlands and those outside the levee system.

Response 2.6: Floodgate closure and pumping would be initiated only when stages on the West Pearl River exceed interior ponding stages. During non-flood events the floodgates will be open to allow normal interchange of water and beneficial nutrients and aquatic organisms between the enclosed wetlands and those outside the levee system.

3.0 GUIDELINES FOR LINEAR FACILITIES

Not applicable

4.0 GUIDELINES FOR DREDGED MATERIAL DEPOSITION

Guideline 4.1: Spoil shall be deposited utilizing the best practical techniques to avoid disruption of water movement, flow, circulation, and quality.

Response 4.1: Materials excavated during construction of the control structures, if found to be suitable, will be utilized as part of the fill material requirements for levee building adjacent to the control structures. Levee fill material will be leveled, shaped and revegetated upon completion of construction. If not suitable for levee construction, the materials would be removed and placed in a designated upland disposal area.

Guideline 4.2: Spoil shall be used beneficially to the maximum extent practicable to improve productivity or create new habitat, reduce or compensate for environmental damage done by dredging activities, or prevent environmental damage. Otherwise, existing spoil disposal areas or upland disposal shall be utilized to the maximum extent practicable rather than creating new disposal areas.

Response 4.2: If excavated materials are found not to be suitable for levee construction, upland disposal will be utilized.

Guideline 4.3: Spoil shall not be disposed of in a manner which could result in the impounding or draining of wetlands or the creation of development sites unless the spoil deposition is part of an approved levee or land surface alteration project.

Response 4.3: Excavated materials would be utilized for levee construction. If not suitable, the material would be removed and placed in an upland disposal area.

Guideline 4.4: Spoil shall not be disposed of on marsh, known oyster or clam reefs, or in areas of submersed vegetation to the maximum extent practicable.

Response 4.4: Construction-related spoil would not be disposed in these types of areas.

Guideline 4.5: Spoil shall not be disposed of in such a manner as to create a hindrance to navigation or fishing, or hinder timber growth.

Response 4.5: Spoil would not create a hindrance to navigation, fishing, or timber growth.

Guideline 4.6: Spoil disposal areas shall be designed and constructed and maintained using the best practical techniques to retain the spoil at the site, reduce turbidity, and reduce shoreline erosion when appropriate.

Response 4.6: Excavation would be accomplished by dragline, and if used for levee construction, materials would be stabilized and turbidity and erosion would be minimal.

Guideline 4.7: The alienation of state-owned property shall not result from spoil deposition activities without the consent of the Department of Natural Resources.

Response 4.7: The proposed action would not impact any state-owned property, in particular the Pearl River Wildlife Management Area. However, construction of the control structures and floodgates would impact approximately 12 acres of state water bottoms.

5.0 GUIDELINES FOR SHORELINE MODIFICATION

Response: No shoreline modifications are proposed.

6.0 GUIDELINES FOR SURFACE ALTERATIONS

Response: Surface alterations of the proposed action are a result of levee and related control structure construction and are examined in Sections 2 and 4.

7.0 GUIDELINES FOR HYDROLOGIC AND SEDIMENT TRANSPORT

Response: The project would not substantially affect hydrologic and sediment transport.

8.0 GUIDELINES FOR DISPOSAL OF WASTES

Not Applicable.

9.0 GUIDELINES FOR USES THAT RESULT IN THE ALTERATION OF WATERS DRAINING INTO COASTAL WATERS

Guideline 9.1: Upland and upstream water management programs which affect coastal waters and wetlands shall be designed and constructed to preserve or enhance water quality, volume, and rate of flow to the maximum extent practicable.

Response 9.1: The two major floodgates and six minor control structures were sited to ensure that natural interior drain patterns remain substantially unaltered. The structures would be closed only when stages in the West Pearl River exceed interior ponding stages. Pumping would be initiated during these periods to evacuate interior runoff into the river system.

Guideline 9.2: Runoff from developed areas shall to the maximum extent practicable be managed to simulate natural water patterns, quantity, quality, and rate of flow.

Response 9.2: See Response 9.1.

Guideline 9.3: Runoff and erosion from agricultural lands shall be minimized through the best practical techniques.

Response 9.3: The proposed project is for the protection of existing residential development from headwater flooding events.

10.0 GUIDELINES FOR OIL, GAS, AND OTHER MINERAL ACTIVITIES

Not applicable.

CONSISTENCY DETERMINATION

Based on this evaluation, the Vicksburg District, Corps of Engineers, has determined that the Slidell, Louisiana-Pearlington, Mississippi, flood control project as currently proposed is consistent to the maximum extent practicable with the State of Louisiana's approved coastal management program.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX G
FISH AND WILDLIFE COORDINATION ACT REPORT

APPENDIX A

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES CORRESPONDENCE

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA 70895

J BURTON ANGELLE, SR
SECRETARY
(504) 925 3617

EDWIN W EDWARDS
GOVERNOR

January 25, 1985

Mr. Charles K. Baxter
U. S. Fish and Wildlife Service
Room 409, Merchants National Bank
  Building
820 South Street
Vicksburg, Mississippi 39180

Re: Slidell, Louisiana - Pearlington,
Mississippi Flood Control Study

Dear Mr. Baxter:

Personnel of our technical staff have reviewed the draft coordination report provided by your office for the above referenced project. We note that the report is accurate and well prepared.

Our personnel have participated in field work as required for the Habitat Evaluation Procedure conducted as part of the project analysis, and have provided information concerning fish and wildlife habitats and resources of the project area.

We concur with the Fish and Wildlife Service's findings, conclusions and recommendations as indicated in the draft report.

Sincerely,

J. Burton Angelle

J. Burton Angelle
Secretary

JBA/CJK/fsb

APPENDIX B

ENDANGERED SPECIES CORRESPONDENCE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
JACKSON MALL OFFICE CENTER
300 WOODROW WILSON AVENUE, SUITE 3185
JACKSON, MISSISSIPPI 39213

March 19, 1984

IN REPLY REFER TO:
Log No. 4-3-84-160

Colonel Dennis J. York
U.S. Army, Corps of Engineers
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel York:

This responds to your letter of February 29, 1984, concerning various flood control measures for the Slidell, Louisiana/Pearlington, Mississippi, study area. We have reviewed the information you enclosed relative to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Our records indicate no endangered, threatened or proposed species, or their critical habitat occurring in the project area. Therefore, no further endangered species consultation will be required for this project, as currently described.

If you anticipate any changes in the scope or location of this project, please contact our office, telephone 601/960-4900, for further coordination.

We appreciate your participation in the efforts to enhance the existence of endangered species.

Sincerely yours,

Dennis B. Jordan

Dennis B. Jordan
Field Supervisor
Endangered Species Field Office

cc: Department of Wildlife & Fisheries, New Orleans, LA
ES, FWS, Vicksburg, MS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
JACKSON MALL OFFICE CENTER
300 WOODROW WILSON AVENUE, SUITE XXXX 316
JACKSON, MISSISSIPPI 39213

May 22, 1985

IN REPLY REFER TO:
Log No. 4-3-84-160

Colonel Dennis J. York
District Engineer
U.S. Army, Corps of Engineers
Post Office Box 60
Vicksburg, MS 39180-0060

Dear Colonel York:

This responds to your letter of May 13, 1985, regarding Alternative J of the Slidell, Louisiana, and Pearlington, Mississippi, flood control study. We have reviewed the information you enclosed relative to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

As you have indicated in your letter of May 13, 1985, the bald eagle (Haliaeetus leucocephalus) is an endangered species which occurs in the vicinity of the proposed project. There are no proposed species or areas listed as critical habitat in the project vicinity.

If you determine this project to be a major Federal action significantly affecting the quality of the human environment (i.e., one requiring an environmental impact statement), Section 7(c) of the Endangered Species Act, as amended, requires that you prepare a biological assessment to determine the effects of the project on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated and before any physical modification of the environment is begun. If the biological assessment is not begun within 90 days, you should verify the species list informally (via phone) prior to initiation of your assessment. When conducting a biological assessment, you shall, at a minimum:

1. conduct a scientifically sound on-site inspection of the area affected by the action, which must include a detailed survey of the area to determine if listed or proposed species are present or occur seasonally and whether suitable habitat exists within the area for either expanding the existing population or potential reintroduction of populations;

2. interview recognized experts on the species at issue, including those within the Fish & Wildlife Service, the National Marine Fisheries Service, state conservation agencies, universities, and others who may have data not yet found in scientific literature;

3. review literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements;

4. analyze the effects of the action on individuals and populations of each species and its habitat, including cumulative effects of the action;

5. analyze alternative sections that may provide conservation measures;

6. conduct any studies necessary to fulfill the requirements of (1) through (5) above;

7. review any other relevant information.

If you determine that the proposed action may affect any of the listed species or critical habitats, you must request in writing formal consultation pursuant to Section 7(a) from our office. Section 7 requirements also apply to proposed species and proposed critical habitat.

If you determine this action not to be one requiring an environmental impact statement, a biological assessment is not required; however, you still have an obligation to review the activity to determine if it may affect listed species or critical habitat and to initiate formal consultation if you find that such an effect may occur.

If you require further information regarding this project, please contact our office, telephone 601/960-4900.

We appreciate your participation in the efforts to enhance the existence of endangered species.

Sincerely yours,

for Dennis B. Jordan
Field Supervisor
Endangered Species Field Office

cc: RD, FWS, Atlanta, GA (AFA/SE)
✓ ES, FWS, Vicksburg, MS
Department of Wildlife & Fisheries, New Orleans, LA

APPENDIX C

HABITAT EVALUATION PROCEDURES

(TERRESTRIAL)

PEARL RIVER BASIN - SLIDELL, LOUISIANA AND PEARLINGTON, MISSISSIPPI

HABITAT EVALUATION PROCEDURES

(TERRESTRIAL)

INTRODUCTION

The Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service (1980) provides a standard quantitative methodology for a uniform approach to impact assessment and project planning. HEP is based on the assumption that vegetative communities have value to wildlife and that positive or negative impacts can be expressed in terms of changes in the quantity and/or quality of wildlife habitat. These impacts can be measured and compared. Additionally, optimum habitat for a certain species can be characterized and any habitat can be compared to the optimum to develop a Habitat Suitability Index (HSI). The HSI is a unitless number bounded by 0 and 1, where 0 represents no habitat and 1 represents habitat which provides optimum life requisites in the form of food, cover, reproduction, etc. .

Habitat suitability can be related to species abundance because of the assumed linear relationship between the HSI and the carrying capacity of a habitat. The HSI for a particular species is determined by utilizing models containing measurable key habitat components in a particular habitat. A value between 0 and 1.0 can be correlated to various levels of carrying capacity in a linear manner; i.e., the difference between 0.1 and 0.2 is the same magnitude as the difference between 0.8 and 0.9. The HSI is an expression of habitat quality per acre per year. Habitat Units (HU) can be obtained by multiplying the HSI for an evaluation species by the total acreage of habitat available for which the HSI was calculated. The impact of land use changes (i.e., changes in key habitat components) can be determined by comparing the HU's anticipated for the future without project habitat conditions to the HU's anticipated in future habitat conditions with the project. Thus, the HEP provides a means to quantitatively evaluate project effects on wildlife habitat and productivity over time.

HABITAT TYPES AND ACREAGE

Baseline cover types for this study were determined by utilizing the data developed by the U.S. Army Engineer Waterways Experimental Station (WES) (Rekas and Stoll, 1984). The location and extent of vegetative types and land use was determined by WES through field reconnaissance and controlled photo-interpretation of 1:12,000 color infrared aerial photography taken in March 1983. The boundaries of the vegetative types were transferred to clear acetate overlays of a 1:24,000 scale for use in association with 1:24,000 scale USGS quadrangle maps. Additionally, the vegetative types and map unit codes were digitized and the data stored in computer files. Data retrieved from the master data base were later used to determine the exact acreage of vegetative types within a given study area, levee alignment, etc.

For HEP purposes, the project area was divided into five cover types which are Cypress-Tupelo Swamps, Pine-Hardwoods, Grassland, Grassland with Trees and Shrubs (Urban), and Other. The predominant woody vegetation of the swamps is cypress, tupelo, and black gum associated with permanent or semi-permanent water. The pine-hardwood cover type contains slash pine, loblolly pine, longleaf pine, and/or shortleaf pine generally in association with obtuse oak, water oak, black gum, sweet gum, and red bay. Grasslands are open areas of native grasses (with very few trees) associated with acid soils and high water tables. This cover type is actually Gulf Coast pitcher plant bogs in early succession (Folkerts, 1984). Successional changes are being brought about by drainage and the reduction of periodic burning. Grassland with trees and shrubs is a designation given to the residential or urban areas within the study boundaries. Vegetation consists mostly of mowed lawn grasses with ornamental shrubs and trees (predominately pine, sweet gum, and water oak). The cover type designated as Other includes openwater bodies not dominated by woody or herbaceous vegetation, roads, railroads, etc. which have little or no habitat value for the evaluation species.

EVALUATION TEAM

The interagency evaluation team consisted of professional biologists from the U.S. Army Corps of Engineers, the Louisiana Department of Wildlife and Fisheries, and the U.S. Fish and Wildlife Service. Table C1 lists the individuals who participated on the evaluation team. A three-person team concept was utilized, i.e., although more than one biologist from an agency was sometimes present during the early planning and the evaluation, no agency had more than one representative who could make a final decision.

EVALUATION SPECIES

A broad range of species were initially considered based on their recreational value, commercial value, public interest, esthetic value, and habitat requirements. The evaluation team selected three animal species to be evaluated which were representative of the wildlife community structure. Models developed for these species by the Service's Habitat Evaluation Procedures Group, Western Energy and Land Use Team were utilized. These models are on file at the FWS Office, 900 Clay Street, Room 235, Vicksburg, Mississippi, and are available for review upon request. The matrix (Table C2) displays the evaluation species and the cover type associations.

ASSUMPTIONS

Based on the best information available, the following assumptions and decisions were made by the evaluation team using their combined professional judgement and expertise:

Without the project

1. During the period leading to Project Year 0 (1992) and from 1992 to 2092 (one hundred year project life) there would be no change in existing [illegible] would remain the same.

TABLE C1

PARTICIPANTS ON THE EVALUATION TEAM

Name	Education	Experience	Professional Discipline
Charles Killebrew	1971-Southeastern Louisiana University-B.S.-Zoology; 1973-SLU-M.S.-Biology; Post M.S. Graduate- Louisiana State University	9 years, Biologist, Louisiana Department of Wildlife and Fisheries	Aquatic Biologist
Jim Stafford	1981-Louisiana Tech-B.S. Forestry and Wildlife Management	2 years, Biologist, Louisiana Department of Wildlife and Fisheries	Wildlife Biologist
Robert Love	1975-Monmouth College-B.A.-Biology; 1981-Louisiana State University-M.S.-Forestry and Wildlife Management	3 years, Biologist, Louisiana Department of Wildlife and Fisheries	Wildlife Biologist
Maryetta Smith	1978-Mississippi College-B.S.-Biologist; Post Graduate work-Mississippi State University	7 Years, Biologist Corps of Engineers, Vicksburg District	Wildlife Biologist
Charles McCabe	1961-Kansas State Univ.-B.S.-Biological Science	10 years, Biologist, Fish and Wildlife Service, Vicksburg, MS; 11 years, Fish and Wildlife Service, FL, LA, and VA	Fish & Wildlife Biologist

TABLE C2

MATRIX OF TERRESTRIAL EVALUATION SPECIES AND COVER TYPES

EVALUATION SPECIES	COVER TYPES			
	Cypress-Tupelo	Pine Hardwoods	Grassland	Grassland with Trees & Shrubs
Raccoon	X	X	X	X
Gray Squirrel	X	X	-	X
Barred Owl	X	X	X	X

2. Land use charges would consist primarily of residential development as determined by the Corps of Engineers Economic Section.

With the project

1. Levees and levee rights-of-way will increase the acreage of habitat for species utilizing the grassland cover type. Additionally, these acres are assumed to have an HSI value equal to the grassland type.

2. Residential development would not occur in designated sump areas leaving acreage and HSI of the areas unchanged.

3. Reduced flooding would not be substantial enough to change vegetative types, therefore, HSI for the species using the area would remain unchanged.

4. Secondary impacts which could occur to Fritchie Marsh, as a result of implementation of Alternative J, were considered insignificant and were not included in this analysis.

5. Since commercial off-site borrow areas would be utilized, they would not have positive or negative effects upon the project area.

SAMPLING METHODS

Sample sites were randomly selected by the evaluation team. Field work was completed during the period of September 4 to 7, 1984. Sufficient samples (67) were taken for statistically valid results. Three samples, a distance of 100 yards apart along a predetermined compass line, were taken at each site.

In forested cover types, the point-centered quarter method as adopted for ecological use (Curtis, 1950) was utilized. In this method the sampling point is considered to be the center of four quadrants oriented along the compass line of traverse. The diameter, height, and species of the nearest tree in each quadrant were recorded. In cypress-tupelo swamps, water depth at the sampling point was also recorded. The total percent crown cover and the percent crown cover of mast producing trees was determined at the sampling point by use of a standard 2X5.5 densitometer. The percent crown cover of herbs and shrubs was measured in an area ten feet long and two feet wide, to a height of the highest vegetation, on either side of the compass line of traverse. The number of snags, tree cavities, and refuge sites were recorded in a circular area (one acre in size) having a radius of 118 feet from the sampling point.

On grassland and urban sites, the types of management, percent forb and herb crown cover, and tree species (if present) were determined from each sampling point. Additionally, the availability of fence rows, ditch bank, and refuge sites were visually determined at each sample site. Field Data Forms are on file at the FWS Office, Vicksburg, Mississippi, and are available for review upon request.

IMPACTS

The basic data which were obtained in the field were utilized to determine the HSI for each of the evaluation species by the following steps:

Step 1 - Determine suitability Indices (SI) for each variable in the model based on field data.

Step 2 - Complete Life Requisite Values (LRV) for the cover types using the functions in the model.

Step 3 - The HSI equals the lowest LRV (the limiting factor for the species).

To calculate the Habitat Units (HU) in the project area with and without the project, the HSI for each species was multiplied by the acreage of habitat available (Table C3). Then, a comparison was made between the Average Annual Habitat Units (AAHU) with and without the project to determine losses or gains as a result of the project. Table C4 displays a comparison of with- and without-project values for Alternatives A, D, and E. These calculations were accomplished by accessing the NOAA computer, located in Boulder, Colorado and utilizing a program known as HEP BATCH.

RESULTS

Table C4 presents the AAHU which would be lost or gained for each alternative as a result of project implementation. The Recommended Plan represents a combination of Alternative A and E. The slight gains (Alternatives D and E) and loss (Alternative A) are attributable to the project and are directly related to the size of the sump area. Simply said, the major land use change, residential development, would be prevented from occurring in the sump area during the life of the project.

TABLE C3

HABITAT UNITS FOR EVALUATION SPECIES BY TARGET YEARS (Form B)

STUDY NAME: SLIDELL PLAN A
PROPOSED ACTION: FUTURE WITHOUT PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	2888	.46	1328.48
Gray Squirrel	2789	.43	1199.27
Barred Owl	2888	.54	1559.52

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	2888	.45	1299.60
Gray Squirrel	2794	.43	1201.42
Barred Owl	2888	.54	1559.52

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	2888	.40	1155.20
Gray Squirrel	2830	.41	1160.30
Barred Owl	2888	.51	1472.88

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	2888	.38	1097.44
Gray Squirrel	2840	.40	1136.00
Barred Owl	2888	.50	1444.00

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	2888	.32	924.16
Gray Squirrel	2888	.38	1097.44
Barred Owl	2888	.46	1328.48

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	2888	.32	924.16
Gray Squirrel	2888	.38	1097.44
Barred Owl	2888	.46	1328.48

STUDY NAME: SLIDELL PLAN A
PROPOSED ACTION: FUTURE WITH PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	2888	.46	1328.48
Gray Squirrel	2789	.43	1199.27
Barred Owl	2888	.54	1559.52

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	2888	.45	1299.60
Gray Squirrel	2794	.43	1201.42
Barred Owl	2888	.54	1559.52

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	2888	.40	1155.20
Gray Squirrel	2769	.41	1135.29
Barred Owl	2888	.50	1444.00

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	2888	.40	1155.20
Gray Squirrel	2779	.40	1111.60
Barred Owl	2888	.49	1415.12

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	2888	.32	924.16
Gray Squirrel	2827	.38	1074.26
Barred Owl	2888	.45	1299.60

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	2888	.32	924.16
Gray Squirrel	2827	.38	1074.26
Barred Owl	2888	.45	1299.60

STUDY NAME: SLIDELL PLAN D
PROPOSED ACTION: FUTURE WITHOUT PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	7496	.52	3897.92
Gray Squirrel	6617	.46	3043.82
Barred Owl	7496	.58	4347.68

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	7496	.51	3822.96
Gray Squirrel	6663	.46	3064.98
Barred Owl	7496	.58	4347.68

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	7496	.42	3148.32
Gray Squirrel	6992	.42	2936.64
Barred Owl	7496	.53	3972.88

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	7496	.40	2998.40
Gray Squirrel	7083	.41	2904.03
Barred Owl	7496	.52	3897.92

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	7496	.28	2098.88
Gray Squirrel	7494	.37	2772.78
Barred Owl	7496	.46	3448.16

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	7496	.28	2098.88
Gray Squirrel	7494	.37	2772.78
Barred Owl	7496	.46	3448.16

STUDY NAME: SLIDELL PLAN D
PROPOSED ACTION: FUTURE WITH PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	7496	.52	3897.92
Gray Squirrel	6617	.46	3043.82
Barred Owl	7496	.58	4347.68

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	7496	.51	3822.96
Gray Squirrel	6663	.46	3064.98
Barred Owl	7496	.58	4347.68

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	7496	.45	3373.20
Gray Squirrel	6766	.43	2909.38
Barred Owl	7496	.54	4047.84

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	7496	.43	3223.28
Gray Squirrel	6795	.43	2921.85
Barred Owl	7496	.53	3972.88

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	7496	.35	2623.60
Gray Squirrel	7057	.40	2822.80
Barred Owl	7496	.49	3673.04

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	7496	.35	2623.60
Gray Squirrel	7057	.40	2822.80
Barred Owl	7496	.49	3673.04

STUDY NAME: SLIDELL PLAN E
PROPOSED ACTION: FUTURE WITHOUT PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	6372	.50	3186.00
Gray Squirrel	5546	.46	2551.16
Barred Owl	6372	.57	3632.04

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	6372	.49	3122.28
Gray Squirrel	5589	.45	2515.05
Barred Owl	6372	.56	3568.32

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	6372	.41	2612.52
Gray Squirrel	5889	.41	2414.49
Barred Owl	6372	.52	3313.44

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	6372	.38	2421.36
Gray Squirrel	5975	.41	2449.75
Barred Owl	6372	.51	3249.72

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	6372	.27	1720.44
Gray Squirrel	6371	.37	2357.27
Barred Owl	6372	.46	2931.12

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	6372	.27	1720.44
Gray Squirrel	6371	.37	2357.27
Barred Owl	6372	.46	2931.12

STUDY NAME: SLIDELL PLAN E
PROPOSED ACTION: FUTURE WITH PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	6372	.50	3186.00
Gray Squirrel	5546	.46	2551.16
Barred Owl	6372	.57	3632.04

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	6372	.49	3122.28
Gray Squirrel	5589	.45	2515.05
Barred Owl	6372	.56	3568.32

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	6372	.44	2803.68
Gray Squirrel	5673	.43	2439.39
Barred Owl	6372	.53	3377.16

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	6372	.42	2676.24
Gray Squirrel	5697	.42	2392.74
Barred Owl	6372	.52	3313.44

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	6372	.34	2166.48
Gray Squirrel	5935	.39	2314.65
Barred Owl	6372	.48	3058.56

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	6372	.34	2166.48
Gray Squirrel	5935	.39	2314.65
Barred Owl	6372	.48	3058.56

STUDY NAME: SLIDELL PLAN J
PROPOSED ACTION: FUTURE WITHOUT PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	8526	.50	4263.00
Gray Squirrel	7422	.46	3414.12
Barred Owl	8526	.57	4859.82

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	8526	.49	4177.74
Gray Squirrel	7447	.46	3425.62
Barred Owl	8526	.57	4859.82

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	8526	.40	3410.40
Gray Squirrel	7813	.42	3281.46
Barred Owl	8526	.52	4433.52

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	8526	.38	3239.88
Gray Squirrel	7904	.41	3240.64
Barred Owl	8526	.51	4348.26

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	8526	.27	2302.02
Gray Squirrel	8333	.37	3083.21
Barred Owl	8526	.45	3836.70

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	8526	.27	2302.02
Gray Squirrel	8333	.37	3083.21
Barred Owl	8526	.45	3836.70

STUDY NAME: SLIDELL PLAN J
PROPOSED ACTION: FUTURE WITH PROJECT
TARGET YEAR: BASELINE (1984)

SPECIES	ACRES	HSI	HU
Raccoon	8526	.50	4263.00
Gray Squirrel	7422	.46	3414.12
Barred Owl	8526	.57	4859.82

TARGET YEAR: 1985

SPECIES	ACRES	HSI	HU
Raccoon	8526	.49	4177.74
Gray Squirrel	7447	.46	3425.62
Barred Owl	8526	.57	4859.82

TARGET YEAR: 1992

SPECIES	ACRES	HSI	HU
Raccoon	8526	.40	3410.40
Gray Squirrel	7725	.42	3244.50
Barred Owl	8526	.51	4348.26

TARGET YEAR: 1994

SPECIES	ACRES	HSI	HU
Raccoon	8526	.38	3239.88
Gray Squirrel	7816	.41	3204.56
Barred Owl	8526	.50	4263.00

TARGET YEAR: 2004

SPECIES	ACRES	HSI	HU
Raccoon	8526	.27	2302.02
Gray Squirrel	8239	.37	3048.43
Barred Owl	8526	.45	3836.70

TARGET YEAR: 2092

SPECIES	ACRES	HSI	HU
Raccoon	8526	.27	2302.02
Gray Squirrel	8239	.37	3048.43
Barred Owl	8526	.45	3836.70

TABLE C4

COMPARISON OF WITH AND WITHOUT PROJECT VALUES FOR ALTERNATIVES A, D, AND E (Form D)

STUDY NAME: SLIDELL PLAN A
PROPOSED ACTION: FUTURE WITHOUT
PROPOSED ACTION: FUTURE WITH

SPECIES	AAHU WITH	AAHU WITHOUT	AAHU CHANGE
Raccoon	962.40	959.19	3.21
Gray Squirrel	1084.18	1106.55	-22.37
Barred Owl	1322.86	1350.54	-27.68

STUDY NAME: SLIDELL PLAN D
PROPOSED ACTION: FUTURE WITHOUT
PROPOSED ACTION: FUTURE WITH

SPECIES	AAHU WITH	AAHU WITHOUT	AAHU CHANGE
Raccoon	2738.47	2264.76	473.71
Gray Squirrel	2842.06	2799.37	42.68
Barred Owl	3733.42	3532.49	200.93

STUDY NAME: SLIDELL PLAN E
PROPOSED ACTION: FUTURE WITHOUT
PROPOSED ACTION: FUTURE WITH

SPECIES	AAHU WITH	AAHU WITHOUT	AAHU CHANGE
Raccoon	2261.47	1855.26	406.22
Gray Squirrel	2332.83	2371.91	-39.08
Barred Owl	3107.53	2991.60	115.94

STUDY NAME: SLIDELL PLAN J
PROPOSED ACTION: FUTURE WITHOUT
PROPOSED ACTION: FUTURE WITH

SPECIES	AAHU WITH	AAHU WITHOUT	AAHU CHANGE
Raccoon	2478.86	2478.86	0.00
Gray Squirrel	3081.32	3114.86	-33.54
Barred Owl	3924.33	3932.62	- 8.29

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A FISH AND WILDLIFE COORDINATION ACT REPORT

ON THE

PEARL RIVER BASIN - SLIDELL, LOUISIANA AND PEARLINGTON, MISSISSIPPI INTERIM REPORT ON FLOOD CONTROL

United States Department of the Interior
FISH AND WILDLIFE SERVICE
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

July 15, 1985

Colonel Dennis J. York
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60
Vicksburg, Mississippi 39180

Dear Colonel York:

This letter and the attached Fish and Wildlife Coordination Act report constitutes the report of the U.S. Fish and Wildlife Service relative to the Pearl River Basin-Slidell, Louisiana and Pearlington, Mississippi, Interim Report on Flood Control. Our report has been prepared under the authority of, and is submitted in accordance with the provisions of the FWCA (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In keeping with the requirements of the FWCA, it should be attached to and made an integral part of your Feasibility Report. This FWCA report was prepared with the cooperation of the Louisiana Department of Wildlife and Fisheries, and their letter of concurrence is included as Appendix A.

We appreciate the opportunity to review, comment, and make recommendation on the proposed project. Please keep us informed of your actions relative to our integral report.

Sincerely yours,

W. J. Olds Jr.

Attachment

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INTRODUCTION

This Fish and Wildlife Coordination Act (FWCA) report addresses the Pearl River Basin - Slidell, Louisiana and Pearlington, Mississippi Interim Report on Flood Control which was authorized by the 1984 Energy and Water Development Appropriations Bill. The U.S. Fish and Wildlife Service (FWS) has reviewed the available data and prepared this report to provide the Corps of Engineers (CE) with our evaluation and recommendations to facilitate planning efforts. Our report is submitted in accordance with provision of the FWCA (48 stat. 401, as amended; 16 U.S.C. 661 et seq.) and has been coordinated with the Louisiana Department of Wildlife and Fisheries (LDWF).

AREA SETTING

The study area is actually composed of three separate areas which have received residential, and to a lesser extent commercial, flood damages in recent years. The two smaller areas include the unincorporated communities of Pearlington, near the East Pearl River in Hancock County, Mississippi, and Pearl River, located in St. Tammany Parish, Louisiana. The other, and much larger, area is located outside the Slidell city limits, between Interstate Highway 59/10 South and the West Pearl River.

Contour maps provided by the CE indicate that elevations in the Slidell study area range from approximately three feet National Geodetic Vertical Datum (NGVD) at the lower end of study area, near the West Pearl River, to the higher elevations of approximately 30 feet NGVD in the upper end of the area. Vegetative associations range from bottomland hardwood wetlands along the West Pearl River to pine and pine-hardwood communities found at higher elevations. Fritchie Marsh, approximately 6,000 acres in size, is located immediately south of the Slidell study area. It consists of freshwater marsh in the northern portion, changing to intermediate marsh and brackish marsh in the southmost part. A study (Rekas and Stoll, 1984), Development of the Land Use and Elevation Master Data Base for the West Pearl River Project Area, detailed the land use and cover types in the Slidell study area. This data proved very useful, particularly in performing the field analyses portion of our Habitat Evaluation Procedures (HEP).

Fishery resources in the vicinity of Slidell are excellent and include marsh, lake, and stream habitats. The principle stream fishery within the study area is the West Pearl River and numerous bayous. This complex ecosystem gives the area a diverse and high quality warm water fishery. The major species of importance are largemouth bass, crappie, catfish, buffalo, gar, crayfish, Atlantic sturgeon, bluegill, and various sunfishes.

Wildlife populations in the undeveloped portions of the Slidell study area are good-to-excellent due to the diversity of habitat. Populations of white-tailed deer, squirrel, rabbit, wild turkey, bobwhite quail, mourning dove, woodcock, wood duck, various species of waterfowl, wading birds, raptors, and songbirds are found in the area. Furbearers present in the area include raccoon, beaver, grey fox, bobcat, muskrat, mink, nutria, skunk, and opossum. A Southern bald eagle nest, which has been active for several years, is located just outside of the study area near White Kitchen. The State owned Pearl River Wildlife Management Area (32,811 acres) is located immediately adjacent to the study area on the left descending bank of the West Pearl River.

PROJECT DESCRIPTION

A broad range of alternative plans were developed by the CE to provide protection for the Pearlington, Pearl River, and Slidell areas. Non-structural plans, such as no action, flood plain evacuation, and flood proofing were eliminated from further study because of unfavorable Benefit/Cost (B/C) ratios. Levee construction alternatives, with associated water control structures and pumping plants, for the Pearlington and Pearl River areas also proved to have B/C ratios of less than unity.

Seven alternative levee alignments (designated A, B, C, D, E, F and J) with associated outlet ditches, water control structures, and pumping plants were analyzed to provide flood protection in the Slidell Area. Alternatives B, C, and F proved to be infeasible either from a B/C ratio or hydrological standpoint. Therefore, Alternatives A, D, E, and J, which have favorable B/C ratios, were identified for detailed studies. This report will address only Alternatives A, D, E, and J. Levee alignments for these alternatives are shown on Plates 1, 2, 3, and 4, respectively. It is our understanding that the material for levee construction would be obtained from borrow pits located outside of the study area for all alternatives.

Alternative A is designed as a means to reduce flood damages north of Interstate Highway 10 to include, but not limited to, the subdivisions known as Ravenwood, Morgan Bluff Estates, Magnolia Forest, River View, Hickory Hill, and River Gardens. The levee would be approximately 4.5 miles in length with an average height of seven feet and a maximum height of 15 feet. Eight minor structures (7X5 feet box floodgate) and one major structure (10X8 feet box floodgate) would be required to provide outlets for interior drainage; as well as a pumping station on Gum Bayou. A boat launching ramp and parking facilities are to be constructed as a project feature on the protected side of the levee to provide boat access to Gum Bayou. The CE studied pumping station capacities of 15, 30, 50, 150, and 250 cubic feet per second (cfs); with sump sizes of 740, 550, 485, 440, and 430 acres, respectively.

Alternatives D, E, and J were developed to provide protection in the flood prone area south of Interstate Highway 10 for numerous subdivisions, trailer parks, and commercial establishments. Alternative D would require a levee approximately 10.1 miles long with an average height of eight feet and a maximum height of 16 feet. Elimination of interior flooding would be accomplished by four minor structures, two major structures, and two pumping stations. One pumping station is to be located on Doubloon Branch and the other near Crossgates. Capacities studied for the larger pumping plant located on Doubloon Branch included 50, 150, 250, 500, and 700 cfs; with associated sump areas of 2150, 1350, 1440, 1320, and 1100 acres,

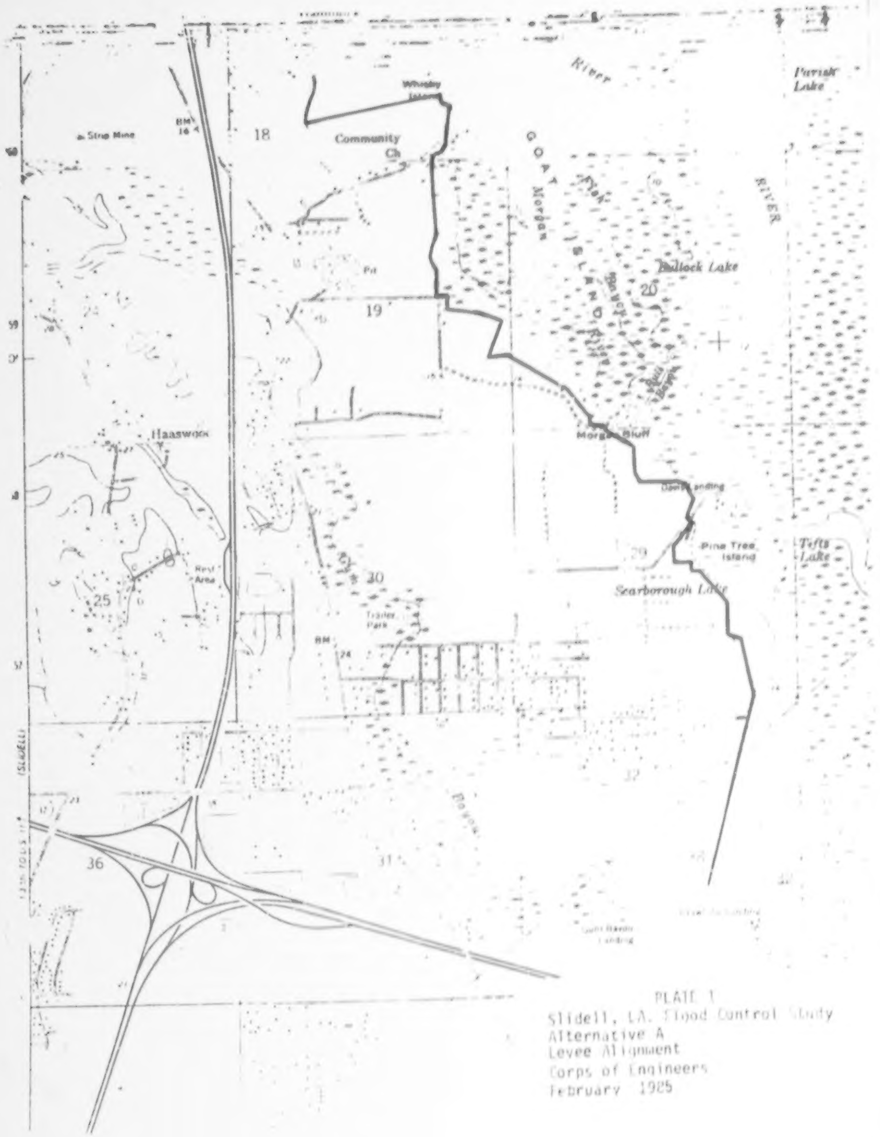

PLATE 1
Slidell, LA. Flood Control Study
Alternative A
Levee Alignment
Corps of Engineers
February 1985

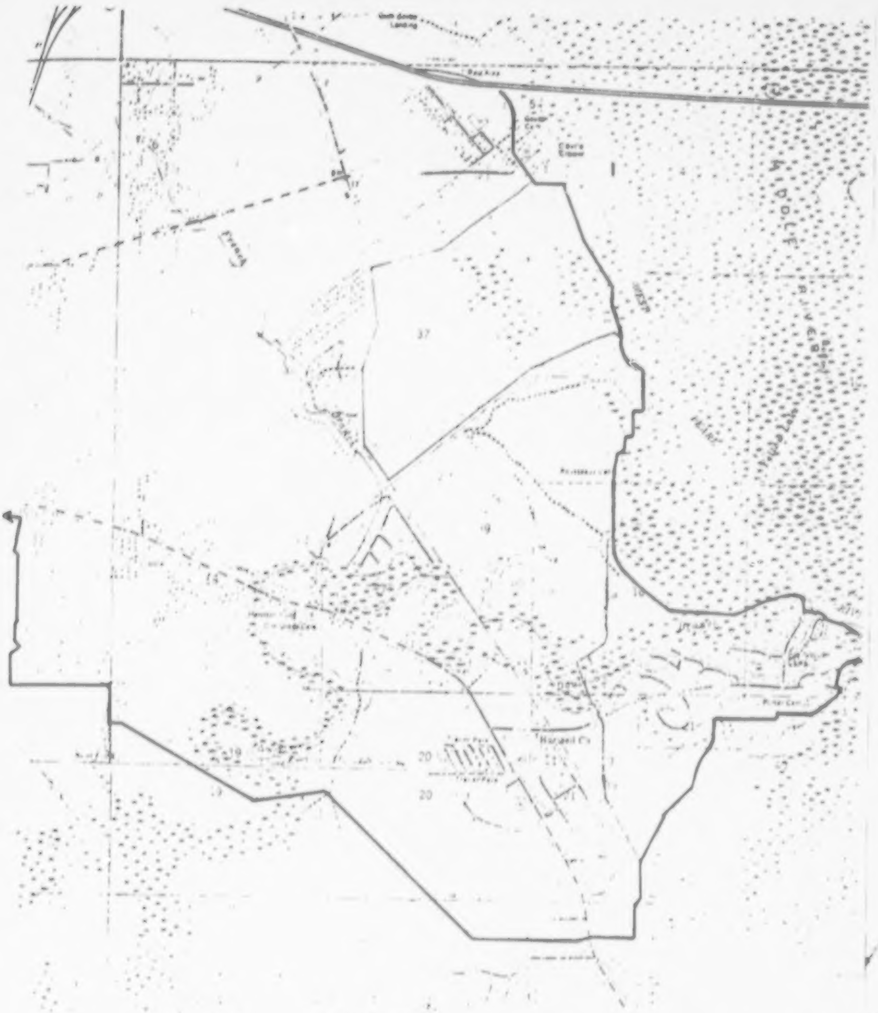

PLATE 2
Slidell, La. Flood Control Study
Alternative D
Levee Alignment
Corps of Engineers
February 1985

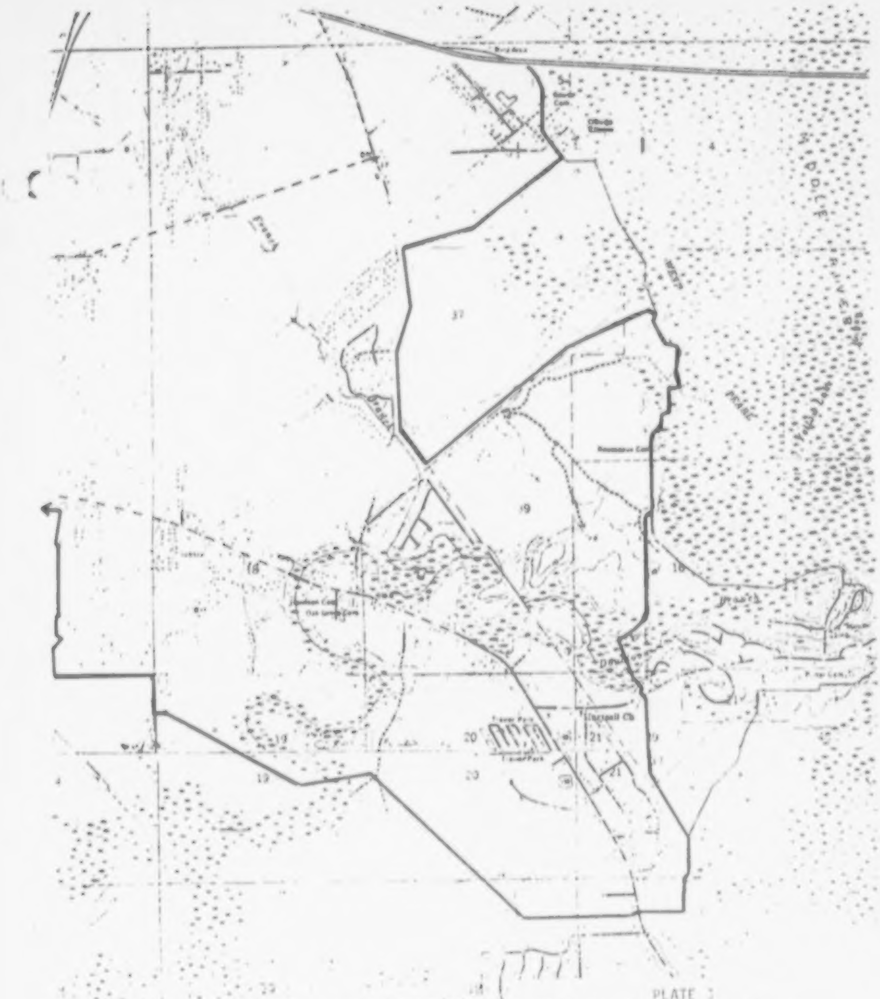

PLATE 3
Slidell, LA. Flood Control Study
Alternative I
Levee Alignment
Corps of Engineers
February 1985

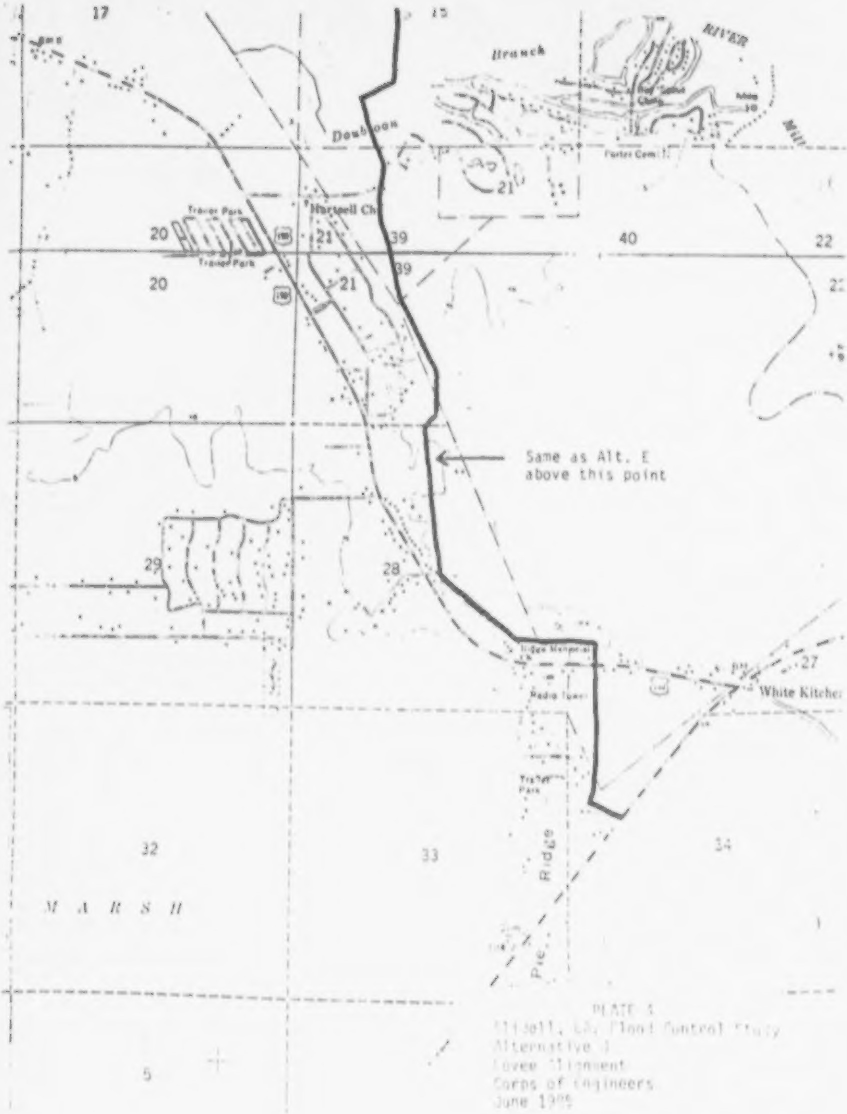

PLATE A
Slidell, LA, Flood Control Study
Alternative J
Levee Alignment
Corps of Engineers
June 1985

respectively. Sizes studied for the smaller pumping station were 15, 30, and 50 cfs with a sump size requirement of 270, 240, and 220 acres, respectively. A navigational flood gate, 56 feet wide, would be installed to provide boat access to Doubloon Branch.

A levee approximately 10.7 miles long is under consideration for Alternative E. This levee would average seven feet in height with a maximum height of 17 feet. Interior drainage would be provided through six minor structures, two major structures, and two pumping stations. The CE studied pumping station capacities of 150, 250, 500, 700, and 1000 cfs facilities on Doubloon Branch with sump sizes of 1460, 1200, 990, 790, and 650 acres, respectively. A boat launching ramp and parking facilities are to be constructed as a project feature on the protected side of the levee to provide boat access to Doubloon Branch. Pumping capacities studied for the smaller station located near Crossgates are 15, 30, and 50 cfs and include associated sumps of 89, 65, and 50 acres, respectively.

Alternative J would require a levee approximately 8.4 miles long with a maximum height of 15 feet and an average height of 6 feet. Interior drainage would be accomplished by two major structures, nine minor structures, one pumping station near Crossgates, enlargement of the bridge opening where Military Road crosses Doubloon Branch, and a 2,600 foot channel cleanout of Doubloon Branch. The pumping station would have a capacity of 15 cfs; with an associated sump of 89 acres.

The Selected Plan is a combination of Alternatives A and E to provide 200 year flood protection. It incorporates the features described above; to include a 50 cfs pumping station and 485 acre sump area (Alternative A) plus 250 cfs and 15 cfs pumping plants and 1,289 acre sump area (Alternative E).

PROJECT IMPACTS

Without the project, the CE has projected that (with the exception of cypress-tupelo swamps and open water areas) 52 percent of the study area would be subject to residential development by the year 1994 and 100 percent would be developed by the year 2004. It is anticipated that the levee alignments being proposed would reduce local flooding of urban areas. A positive aspect of the project, from an environmental standpoint, is the boat ramps associated with Alternatives A and E and the navigational flood gate associated with Alternative D to provide sportsmen access to Gum Bayou and Doubloon Branch, respectively. Another positive impact is the prevention of residential development in the sump areas by means of zoning. Each alternative would, however, have adverse impacts upon fish and wildlife resources. These impacts include the direct loss of wildlife habitat associated with levee rights-of-way and construction sites, decreased habitat productivity due to reduced flooding, and reduction in water exchange and/or recharge to and from the West Pearl River. It is our understanding that to lessen impacts, the floodgates would be allowed to remain open, except during flood times, to allow fish passage and water exchange to and from the Pearl River. Alternative J could also have some secondary impacts upon Fritchie Marsh by eliminating freshwater, sediment, and nutrient recharge during major floods. No indirect fish and wildlife losses within the protected areas would result from induced residential development in currently undeveloped areas or an accelerated time frame in which development would occur.

We do not anticipate that the current levee alignments would impact the Pearl River Wildlife Management Area. Additionally, our Endangered Species Office, located in Jackson, Mississippi, has indicated by letters dated March 19, 1984 and May 22, 1985, (Appendix B) that no endangered, threatened, or proposed species or their critical habitat occur in the project area.

A Habitat Evaluation Procedures (HEP) (U.S. Fish and Wildlife Service, 1980) analysis was conducted by an interagency team of biologists in 1984 as a means of quantifying the biological impacts of the various project alternatives upon terrestrial resources. Details of the HEP analysis are contained in Appendix C and include a description of the methodology, assumptions, and results.

DISCUSSION

This flood control study is being conducted with the primary purpose to provide protection of human health, safety, and welfare in the urban area near Slidell. The FWS is amenable to the concept of levees for flood protection; provided that certain considerations are given, if implementation occurs, and additional methods of flood control are utilized. In this regard, the FWS has several recommendations for incorporation into the planning process.

It is the opinion of the FWS that flood damages in the study area, which precipitated the need for flood control features, are a direct result of encroachment and unwise land use development in the base floodplain, an area that has historically flooded. Residential and commercial concerns have encouraged floodplain development in the past and continue to do so, even at the risk of possible future flood damages. Based upon the flood mapping completed by the Federal Emergency Management Agency, zoning or building ordinances in parts of the Slidell study area, are enforced by St. Tammany Parish. All new construction is required to be elevated above the 100 year flood delineation. It would appear, based on flood damages sustained during the 1983 flood, that more restrictive regulations concerning development in the Slidell area should be utilized in the future to prevent additional flood losses.

Effective methods for reducing flood losses involve not only the physical control of floodwaters, but the management of damage susceptible land uses as well. Despite substantial efforts by the Federal Government to protect floodplains, the annual losses from flooding continue to increase. These problems arise mainly from unwise land use practices that occur in the base floodplain.

Executive Order 11988, Floodplain Management, has recognized these concepts and the need for a redirection of effort. Each agency has been directed to "provide leadership" and to "take action to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health and welfare, and preserve the natural and beneficial values served by floodplains. . .". The stated objective of the President's Executive Order is "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative...".

Additionally, Section 73(a) of the Water Resource Development Act of 1974 states that, "In the survey, planning, or design by any Federal agency of any project involving flood protection, consideration shall be given to nonstructural alternatives to prevent or reduce flood damages including, but not limited to, floodproofing of structures; floodplain regulation; acquisition of floodplain lands for recreational, fish and wildlife, and other public purposes; and relocation with a view toward formulating the most economically, socially, and environmentally acceptable means of reducing or preventing flood damages."

To conform to this flood damage reduction approach, projects aimed at reducing existing damages must actively address the problems of continuing encroachment of flood susceptible land uses into the base floodplain. The Service believes that floodplain zoning, a primary tool in nonstructural flood control, should be incorporated into current project planning to prohibit additional development of flood susceptible land uses in the base floodplain. Zoning would, of course, need to be adjusted accordingly in the protected area if levee construction is completed.

In addition to zoning as it relates to structures, non-development easements should be obtained or restricted use zoning placed upon certain lands within the areas encompassed by levees. These lands could be utilized for pump storage, play grounds, wildlife, picnicking, outdoor recreation, and other such uses. Furthermore, interests in those lands utilized for levee rights-of-way and construction sites which would allow for hiking, jogging, nature photography, birdwatching, or other non-consumptive uses would enhance the multiple purpose aspects of any recommended water resource project.

Concerning the levee alignment for Alternative A, we are pleased that the CE has realigned the levee to avoid encompassing Pine Tree Island and the wooded acres south of Pine Tree Island, as recommended in our planning aid letter of June 5, 1984. At that time, not realizing the size of the sump area needed for the pumping station, we also recommended a realignment on the lower end of levee. Extensive coordination between our agencies has determined that additional modification would not be feasible because of sump size and location, therefore, we are in agreement with the levee alignment currently proposed for Alternative A. Additionally, the current levee alignment would avoid any adverse impacts to the two Louisiana Natural and Scenic Streams (Morgan River and the West Pearl River) located in or adjacent to the project area.

As previously stated, Alternatives D, E, and J were considered as methods to reduce flood damages south of Interstate 10 and would result in loss of fish and wildlife resources as a result of levee construction and blockage of water exchange to and from the West Pearl River. Alternatives D and J would result in the most residential development because the alignments are designed to provide flood protection in undeveloped areas. It is of concern to the FWS that over 50 percent of the acreage to be provided flood protection consists of undeveloped woodlands and wetlands which would be subject to residential development. Extensive modifications of levee alignment would be necessary for the proposals to become acceptable. Therefore, because of the significant residential development associated with Alternative D and J, we are opposed to any further consideration of these alignments.

The FWS considers Alternative E to be a realistic approach to project planning since the levee alignment incorporates the minimum amount of undeveloped acreage, while providing protection to currently developed areas. Another positive aspect of Alternative E is the boat ramp and parking facilities to be developed on Doubloon Branch to provide recreational access. Therefore, the FWS believes that the tentatively Selected Plan, which represents a combination of Alternatives A and E, is the best approach to meeting project objectives.

The FWS has employed HEP as a basic analytical method to identify and quantify project impacts associated with this project. The HEP is a habitat-based approach for assessing project impacts and provides a standard quantitative methodology for impact assessment and project planning. HEP is used to document the quantity and quality of available habitat for selected wildlife species. The procedures are based on the assumption that vegetative communities have value to wildlife and that impacts can be expressed in terms of modifications to the quantity and quality of this habitat. Further, the procedures provide a means of quantifying these modifications in order that they may be annualized and the impacts of the with- and without- project conditions compared. Thus, the HEP provides a means of quantitatively evaluating the effects of a project on wildlife habitat and its productivity over time.

As documented in the HEP analysis (Appendix C), it has been determined that the Selected Plan would result in a slight increase in average annual habitat units over the life of the project. Therefore, the FWS believes that the project has been designed to avoid or minimize terrestrial resource impacts to the greatest extent possible. This is in keeping with the goals and objectives contained in the FWS Mitigation Policy.

It should be noted, however, that the lack of terrestrial impacts associated with the Selected Plan is directly related to the size of the sump area. The 1,774 acre sump area is designed for pump storage, thus floodprone development is to be prohibited by zoning ordinances to be obtained by the local sponsor. We are concerned that the zoning ordinances may not be stringent enough or strictly enforced to the point that such development is precluded. Historically, restrictions have not been enforced in sump storage areas and, as a result, encroachment into the sumps has adversely impacted project operations. When flood control effectiveness is thus reduced, local citizens then request additional flood control measures. The designated sump area is an essential feature of the Selected Plan. Therefore, preventing future flood control problems requires that the sump be designated exclusively as a floodwater storage area. No development or activities can be permitted within the designated sumps that would reduce project effectiveness or interfere with project operations.

It is our understanding that Interstate Highway 10 and Highway 90 act as impediments to flood flows. Thus, flood stages upstream are increased and downstream flood stages are decreased. Current plans by the Highway Department are to increase the openings under Interstate 10 by an additional 1,000 feet. Studies are underway to determine if modifications will be required on Highway 90 and 190. The CE has taken these proposed changes into consideration in developing hydrology for alternative plans.

For those people owning structures which are not provided protection by the levees, the CE should pursue an additional means of flood protection. That alternative would be to encourage State and/or Federal tax incentives for those owners who wish to provide their own means of flood proofing. Obviously, an upper limit as to the dollar amount would have to be established and the tax incentives would probably need to be restricted to those who have suffered flood damage in the last five years.

CONCLUSIONS AND RECOMMENDATIONS

Concerning levee alignments, we are pleased that the cooperative attitude of your personnel has resulted in Alternatives A and E, which are environmentally acceptable to the FWS. The Selected Plan is equally acceptable to the FWS, and we believe that levee construction and associated features could be implemented and not result in significant impacts upon fish and wildlife resources. Additionally, we believe that certain non-structural features should also be incorporated to further reduce future flood damages. Therefore, based upon discussion contained within this report, the FWS makes the following recommendations:

1. No further consideration be given to Alternative D and J.
2. The Selected Plan be implemented to provide flood protection in the Slidell project area.

3. Interests in levee rights-of-way and construction sites should be purchased for non-consumptive recreational use.

4. Restrictive use zoning or non-development easements should be implemented by the local sponsor, prior to project construction, and contain language stringent enough to ensure that floodprone development does not occur and that undeveloped lands in the sump area are utilized for water storage, wildlife, outdoor recreation, and other flood sensitive land uses.

5. More restrictive floodplain zoning should be implemented by the appropriate governmental agency in the Slidell area to discourage additional development in the base floodplain.

6. State and/or Federal tax incentives should be sought for those people outside the protected area(s) who are willing to provide their own means of flood proofing.

LITERATURE CITED

Rekas, A. M. B., and J. K. Stoll. 1984. Development of the land use and elevation master data base for the West Pearl River project area. U.S. Army Engineer Waterways Experiment Station.

U.S. Fish and Wildlife Service. 1980. The habitat evaluation procedures. USDI, Fish and Wildlife Service, Ecological Services Manual 102. 124 pp.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX H
SECTION 404(b)(1) EVALUATION

1. Project Description.

a. Location. The proposed action, the combination of Plans A and E, 200-year design, would be located approximately 1.5 miles east of Slidell, Louisiana, adjacent to and within the West Pearl River flood plain. The flood control levee system would extend from just north of the Ravenwood and Morgan's Bluff subdivisions to south of Belle Acres Subdivision.

b. General description. The major feature of the recommended plan is the 15-mile levee system which includes the 4.5-mile Reach 1 (Plan A) north of I-10 (Plate J-11) and the 10.5-mile Reach 2 (Plan E) south of I-10 (Plate J-15). Integral to the levee system are three pumping stations with major floodgate structures and 14 minor slide gate control structures. Reach 1 includes a 50-cubic-foot-per-second (cfs) pumping station and a 10- by 8-foot floodgate on Gum Bayou, a boat-launching ramp and parking facilities at the Gum Bayou structure, and 8 minor structures. Reach 2 includes a 15-cfs pumping station with a 5- by 5-foot floodgate located south of the Cross Gates Subdivision, a 250-cfs pumping station with a double 7- by 8-foot floodgate on Doubloon Bayou, and six minor structures. Approximately 1,774 acres of sump storage would be required, 485 acres at the 50-cfs station, 89 acres at the 15-cfs station and 1,200 acres at the 250-cfs station. The Reach 1 levee would have an average base width of 58 feet, an average height of 5.8 feet, and a maximum height of 16 feet. The Reach 2 levee would have an average base width of 58 feet, an average height of 5.8 feet, and a maximum height of 16 feet. Floodgates would be closed and pumping initiated only when stages on the West Pearl River exceed interior ponding stages. Pumping would be initiated inside the sump when the water level exceeds 3.6 feet, National Geodetic Vertical Datum (NGVD), north of I-10 (Reach 1); 3.6 feet, NGVD, south of I-10 near Cross Gates Subdivision; and 2.6 feet, NGVD, on Doubloon Bayou.

c. Purpose and authority.

(1) The purpose of this study is to provide flood control to the Slidell, Louisiana, and Pearlington, Mississippi, areas.

(2) The Slidell, Louisiana, and Pearlington, Mississippi, flood control study is being conducted as an interim study of the Pearl River Basin. It was authorized by eight Congressional resolutions including two for which studies were already funded. The resolutions are listed below:

Date	Resolution	Committee
1 Apr 63	Town Creek at Jackson, Mississippi	Senate Public Works
27 Jun 67	Town Creek at Jackson, Mississippi, downstream to Byram	Senate Public Works
12 Mar 74	Pearl River Basin, Mississippi and Louisiana	Senate Public Works
1 Feb 79	Richland Creek, Richland, Mississippi	Senate Environment and Public Works
9 May 79	Pearl River Basin, Mississippi and Louisiana	Senate Environment and Public Works
9 May 79	Richland, Mississippi	House Public Works and Transportation
9 May 79	Pearl River Basin, Mississippi and Louisiana	House Public Works and Transportation
9 May 79	Pearl River, Mississippi	House Public Works and Transportation

d. General description of dredged or fill material.

(1) General characteristics of material (grain and soil type). The Deweyville Terrace sediments will be the foundation for most of the levee except where the levee traverses low-lying areas which are generally recent alluvial deposits. Soil borings generally indicate that north of I-10, except for a 1- to 3-foot-thick veneer of silt on silty sand in some locations, the surface is capped by 6 to 18 feet of stiff clay. Silt and silty sand lenses make up the remainder of the fine grained deposits which are underlain by 25 to more than 80 feet of medium grained sand that contains some gravel and wood. South of I-10, except for the 1- to 3-foot-thick veneer of silt, the surface is capped by 8 to 45 feet of medium stiff to very stiff clay that contains lenses of silt, silty sand, and/or sand. This is underlain by fine to medium grained sand. Soft clay was noted in low-lying areas indicating that these locations are recent alluvial deposits. Because of the low flat topography, ground water is generally within 1 to 3 feet of the ground surface in most areas and seldom more than 10 feet below ground surface. Excavation required at structure locations will be in low-lying areas where it is assumed that at least 10 feet of the top stratum is soft fine grained material with a high water content. Vicksburg District related levee construction contract

will stipulate that impervious clays and silts be utilized as levee fill material. Review of existing documents and records of the principal sources and users of these types of fill material in the Slidell vicinity found no record or indication of the likelihood of contaminants present above background levels. Based on this review, there is no reason to believe that contaminants would be present in levee fill material to be discharged into the waters of the United States that would be likely to degrade the aquatic environment. Therefore, in accordance with EPA proposed rules for testing requirements for the specification of disposal sites for dredged or fill material (Federal Register, December 1984), fill materials were classified as Category 5.

(2) Quantity of material (cubic yards). Approximately 420,000 cubic yards of material will be excavated at the 14 minor structure sites; 100,000 cubic yards at the 15-cfs pumping site; 150,000 cubic yards at the 50-cfs site; and 500,000 cubic yards at the 250-cfs site. The excavated material, if suitable, will be used for fill and levee construction at the proposed sites. Approximately 217,000 cubic yards of fill material will be required for levee construction for sections of the levee that cross low-lying designated wetland areas. Approximately 3,600 tons of riprap will be placed at each pumping plant. Reach 1 will transverse .73 mile of wetland area above I-10. Reach 2 will transverse .56 mile of wetland area south of I-10.

(3) Source of material. Excavated material will be from forested areas and channel bottoms. Most levee fill material and riprap will be acquired offsite from upland commercial sources.

e. Description of the proposed discharge sites.

(1) Location. The discharge sites are located within the natural flood plain of the West Pearl River and its related tributaries; Gum Bayou north of I-10 and French Branch, and Doubloon Bayou south of I-10. The wetland delineations are presented on Plate J-24. The extent of upper wetland limits as presented are generalized elevations and vary from one location to another.

(2) Size. Approximately 29 acres of wooded swamps and 1 acre of water bodies are required for levee and drainage structures rights-of-way. An additional 1,774 acres are required for sump storage adjacent to the pumping stations, 485 acres along Gum Bayou, 89 acres south of Cross Gates Subdivision, and 1,200 acres in the Doubloon Bayou area.

(3) Type of site. Placement of excavated and fill material will be in unconfined sites. The sites will be revegetated with grasses immediately after construction.

(4) Type of habitat. Approximately 68 percent of the entire 65,000-acre study area is classified as wetlands. Of this total, approximately 17,000 acres are classified as either water tupelo-swamp tupelo or cypress-tupelo. The better-drained natural levees and ridges support pine and mixed hardwoods including water oak, willow oak, obtusa oak, nuttall oak, live oak, bitter pecan, magnolia, bays, sweetgum, and sycamore. Ridges in the cypress-tupelo areas support water oak and diamond oak.

(5) Timing and duration of discharge. The time of discharge is dependent on the completion of reconstruction planning and construction. Construction is proposed to begin in late 1988 or early 1989. Approximately 2 years will be required for the actual earthwork.

f. Description of disposal methods. The material will be excavated and discharged by the use of a dragline.

2. Factual Determinations.

a. Physical substrate determinations.

(1) Substrate elevation and slope. Sliding stability analyses were performed for the area north and south of I-10 on a levee section with a height of 15 feet. This would be representative of levee sections that occur in the low-lying areas. Side slopes for the levee were 1V on 4H landside and 1V on 3H riverside. Based on proposed invert elevations which would require shallow excavation and soil stratification from the nearest borings at the 14 minor structures (mostly clays), it appears that little or no dewatering will be necessary for excavation and construction of these structures. The three major structures will be excavated in clays, silts, and fine sands. Piping and slough sides could cause minor problems in the bottom of the inlet channels. However, these measures will be accounted for and prevented during detailed design of each structure. Some riprap placement will be associated with the pumping plant structures. Riprap will be placed in the channel bottoms and on the channel slopes to existing ground elevations. Specific dimensions of limits will be determined during detailed design.

(2) Sediment type. Sediments will consist of fine grained clays, silts, and silty fine sands.

(3) Dredged/fill material movement. The excavated material will be shaped and revegetated as soon as possible to minimize erosion. The levee section should be a homogeneous section composed of impervious clay and/or silt materials. After construction is completed, levee sections will be

revegetated with grasses. After vegetation is established, fine grained materials will be stabilized. Any annual flooding of these sites will only resuspend sediments in a similar manner as existing sediments.

(4) Physical effects on benthos. Placement of dredged and fill material in the flood plain would preclude to a minor degree the area for temporary colonization during flood periods. However, considering the extent of the flood plain within the study area, the loss of these areas' benthic potential would be minimal. The riprap should provide additional area for benthos colonization.

(5) Actions taken to minimize impacts. The revegetation of the disposal areas will minimize erosion and subsequent return of sediments to receiving waters. Suitable excavated materials from the construction of major structures will be incorporated into the levees.

b. Water circulation, fluctuation, and salinity determinations.

(1) Water.

(a) Salinity. Although the project area is in a coastal region, no salinity gradient exists at the project site.

(b) Water chemistry. There should be no significant effects on water chemistry.

(c) Clarity. The Pearl River in the reach of the project is classified by the State of Louisiana as scenic. Clarity is high with an average Secchi Disc depth of 15 centimeters. Construction activities may introduce some turbid flows into the river, but they would be of short duration and minimal volumes.

(d) Color. There may be a slight change in color during construction, but the effect should not be significant.

(e) Odor. No effect.

(f) Taste. Not applicable.

(g) Dissolved gas levels. There should be no appreciable change in the river; however, there may be lower dissolved oxygen levels during construction. The disturbance of the sediment may increase BOD along with reduction in photosynthesis. Long-term impacts may reduce dissolved oxygen levels by reducing circulation during low flow periods, but not significantly lower than existing conditions.

(h) Nutrients. There may be some localized increases in nutrients released to the water column due to construction, but no long-term increases are expected.

(i) Eutrophication. Temporary nutrient increases are not expected to produce appreciable increases in the degree of eutrophication rates in adjacent stream segments and permanent water wetlands (cypress-tupelogum).

(2) Current patterns and circulation.

(a) Current patterns and flow. The placement of excavated and/or fill material at the construction site will modify flow patterns by obstructing flow during the initiation of flooding and evacuation of floodflows to a minor extent. The result of this alteration of circulation would be a change in substrate erosion and deposition rates and the rate and extent of mixing of dissolved and suspended components of the water body.

(b) Velocity. There will be little effect on velocity since the proposed levee system is for protection from backwater flooding.

(c) Stratification. No effect.

(d) Hydrologic regime. Construction of the levees and floodgates will reduce runoff in the area during construction. Operation will prevent backwater flooding only and will not affect runoff.

(3) Normal water level fluctuations. No effect.

(4) Salinity gradients. No effect.

(5) Actions that will be taken to minimize impacts. Exposed soil will be contoured and seeded as soon as possible to minimize erosion and turbidity in receiving streams. Construction of structures and pumping plants will be scheduled during low water periods to minimize impacts.

c. Suspended particulate/turbidity determinations.

(1) Expected changes in suspended particulates and turbidity levels in vicinity of disposal site. Suspended particulate levels will increase in the channels where structures are constructed. Localized increases in turbidity will occur only during construction. During flood conditions when the gates are closed, turbid riverflow will be confined to the unprotected areas riverside of the levees.

(2) Effects (degree and duration) on chemical and physical properties of the water column.

(a) Light penetration. Increased turbidity at the construction sites will reduce light penetration and lower the rate of photosynthesis and primary productivity to a very minor degree in the immediate aquatic areas. Reductions will be short term, localized, and occur only during construction periods.

(b) Dissolved oxygen. Lower dissolved oxygen levels may occur during construction as a result of reduced photosynthesis and distribution of organic oxygen demanding bottom deposits into the water column. Over the long term of the project, somewhat lower dissolved oxygen levels may be observed in the flood protected areas as a result of reduced circulation, but degree may not be significant.

(c) Toxic metals and organics. There should be little effect on toxic metals; however, degradation of organics may be slowed by lower dissolved oxygen levels.

(d) Pathogens. Pathogenic organisms and viruses are not known to be prevalent in these areas.

(e) Esthetics. Turbid plumes may be visible from rainwater runoff and during construction. Pumping will be initiated only during flood stages when turbidity levels and the river are such that pumping should not result in any significant esthetic impacts.

(3) Effects on biota.

(a) Primary production, photosynthesis. The periodic reduction in light transmission as a result of dredged material erosion and resuspension of sediments will periodically reduce photosynthesis and primary production.

(b) Suspension/filter feeders. No significant effect.

(c) Sight feeders. No significant effect.

(4) Actions taken to minimize impacts. All disturbed areas will be revegetated as soon as possible following construction.

d. Contaminant determinations. There are no known contaminants in the project area. The West Pearl River is listed as a natural and scenic stream, indicating high water quality. Examination of water quality data in the vicinity confirmed this assumption.

e. Aquatic ecosystem and organism determinations.

(1) Plankton effects. No significant effects are expected to occur to plankton within the area affected by the discharges. Water clarity in floodwaters and adjacent streams in the immediate vicinity of the disposal sites will be reduced somewhat temporarily and will in turn reduce photosynthetic production somewhat.

(2) Benthos effects. Any benthic organisms in the construction areas will be lost.

(3) Nekton effects. No mortality to free swimming species is expected. During rains and flood stages, temporary minor reductions in dissolved oxygen concentrations and photosynthetic production, minor increases in carbon dioxide and other gas concentrations, increased turbidity, suspended sediments, and possible minor increases of toxic substances in the immediate area could result in temporary minor increased stresses on fishes and other aquatic species.

(4) Aquatic food web effects. No significant effects are expected.

(5) Special aquatic sites effects.

(a) Sanctuaries and refuges. The proposed action would not impact the Pearl River Wildlife Management Area. The state-designated natural and scenic West Pearl River will generally not be impacted by the proposed action. Floodgate closure and pumping will be initiated only when stages, volume, and velocity on the West Pearl River are abnormally high.

(b) Wetlands. Less than 30 acres of wetlands will be directly impacted by the clearing of levee rights-of-way. Approximately 816 acres of wetlands would be within the designated sump storage areas. The majority of the area is water tupelo-swamp tupelo and further development within these sump areas would be prohibited by the local sponsor. Flood control structures located in these wetlands would normally be open to ensure that natural drainage patterns continue. These structures will be closed only during major flood stages. However, wetlands landside of the levee could possibly experience some degree of impact over time when the hydrology is modified by the reduction of the 100-year and greater flooding events. Future urbanization of adjacent lands could impact the longevity of these areas by increased sediment loading.

(c) Mudflats. Not applicable.

(d) Vegetated shallow. No impact.

(e) Riffle and pool complexes. Not applicable.

(6) Threatened and endangered species. According to the U. S. Department of Interior Endangered Species Office, the proposed action will not jeopardize the continued existence or modify the critical habitat of any threatened or endangered species.

(7) Other wildlife. Due to the small area directly impacted by actual construction activities, impact to wildlife forms should be minimal.

(8) Actions to minimize impacts. The recommended plan was sited to avoid wooded swamps where possible. Control structures will be operated only during major flood events allowing normal drainage to continue.

f. Proposed disposal site determinations.

(1) Mixing zone determinations. There is no open water disposal anticipated. Construction of the major control structures would be accomplished in the dry. The temporary mixing zones that may be required to initially dilute somewhat higher concentrations of dissolved materials added to aquatic areas are not expected to be large in size.

(2) Determination of compliance with applicable water quality standards. Based on information presented, the discharges are not expected to violate the State of Louisiana Water Quality Criteria.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supply. Not applicable.

(b) Recreational and commercial fisheries. No significant effect.

(c) Water-related recreation. Boat-launching ramps are proposed at the Gum Bayou and Doubloon Bayou control structures to provide access for general maintenance of inlet channels, sump areas, and pump facilities. These ramps will also provide access needed by the State of Louisiana, Department of Wildlife and Fisheries, to continue regular chemical spraying for controlling the growth of water hyacinths. These ramps may have some incidental recreation use, but will not include designated parking facilities.

(d) Esthetics. No significant effect.

(e) Parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves. No significant effects.

g. Determination of cumulative effects on the aquatic ecosystem. The proposed discharge and fill actions previously discussed should not have a significant adverse effect on the aquatic ecosystem.

h. Determination of secondary effects on the aquatic ecosystem. Both the primary and secondary effects on the aquatic ecosystem are considered to be minimal.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

FINDING OF COMPLIANCE

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. The proposed pumping plants are engineeringly located to benefit from the topography of the land to minimize excavation necessary for inlet and outlet channel construction. No other sites were evaluated during detailed studies presented in the Main Report. Confined disposal sites and removal of material to upland sites were considered.

3. The discharges of the various materials are not expected to violate the State of Louisiana Water Quality Criteria. As shown in Attachment 1, the State of Louisiana has issued a Water Quality Certification for the proposed project in accordance with Louisiana Revised Statutes of 1950, Title 30, Chapter 11, Part IV, Section 1094A(3) and provisions of Section 402 of the Clean Water Act (Public Law 95-217).

4. The discharge of the various materials should not result in the violation of the applicable toxic effluent standard or prohibition under Section 107 of the Clean Water Act.

5. The discharges will be in compliance with the requirements of the Endangered Species Act of 1973.

6. The project is located in inland fresh waters, and no impacts are expected to occur to environments covered by the Marine Protection, Research, and Sanctuaries Act of 1972.

7. The discharge of material should not result in any significant adverse effects of municipal and private water supplies, recreation and commercial fisheries, plankton, shellfish, wildlife, or any special aquatic sites and should not have any significant adverse effects on human health and welfare. The discharges should not result in any significant adverse effects on aquatic ecosystem diversity, productivity, and stability, and should not have any significant adverse effects on recreational, esthetic, and economic values.

8. Revegetation of levees will minimize potential adverse impacts of the discharges on the aquatic ecosystem.

9. On the basis of the guidelines, the proposed disposal sites for the discharge of dredged and fill material are specified as complying with requirements of these guidelines.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

ATTACHMENT 1
APPENDIX H

STATE OF LOUISIANA WATER QUALITY CERTIFICATION

Louisiana Department of Environmental Quality

PATRICIA L. NORTON
SECRETARY

OFFICE OF WATER RESOURCES

J. DALE GIVENS
ASSISTANT SECRETARY

February 14, 1986

WQC 850912-06

Department of the Army
Vicksburg District, Corps of Engineers
P.O. Box 60
Vicksburg, Mississippi 39180-0060

Attention: Planning Division

Gentlemen:

RE: Proposal for the Slidell La. and Perlington, Mississippi Flood Control Project. Proposed structures include a 4.5 mile long levee with drainage structures and a pump station, and a 10.5 mile long levee with two pump stations. Vicinity of Slidell, St. Tammany Parish, La.

This is to acknowledge receipt of "Proof of Publication" of public notice, above reference, forwarded to you with our letter dated September 23, 1985 and to advise that no complaints relative to this project have been received by this agency within the ten day period stipulated in the notice.

It is our opinion that your proposed project will not violate water quality standards of the State of Louisiana; therefore, we offer no objection to the activities proposed therein provided turbidity during dredging in State waters is kept to a practicable minimum.

In accordance with statutory authority contained in the Louisiana Revised Statutes of 1950, Title 30, Chapter 11, Part IV, Section 1094 A(3) and provisions of Section 402 of the Clean Water Act (P.L. 95-217), the Office of Water Resources certifies that it is reasonable to expect that water quality standards of Louisiana provided for under Section 303 of P.L. 95-217 will not be violated.

Very truly yours,

J. Dale Givens

J. Dale Givens, Assistant Secretary
Office of Water Resources

JDG/LW/mp
cc: Vicksburg Corps of Engineers

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX I
PUBLIC VIEWS AND RESPONSES

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SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX I
PUBLIC VIEWS AND RESPONSES

INTRODUCTION

1. The purpose of this appendix is to document the public coordination which has continued throughout the Slidell, Louisiana, and Pearlington, Mississippi, study. Elements of the public involvement program which are described in the following paragraph include coordination with Congressional and local interests, coordination with state and other Federal agencies, public meetings, and the distribution and review of the draft feasibility report.

COORDINATION WITH CONGRESSIONAL AND LOCAL INTERESTS

2. Close coordination has been maintained with Congressional and local interests throughout the course of this study. To date, a total of ten Congressional status reports regarding the Slidell-Pearlington study have been prepared. These status reports were transmited to both the Senate and House Subcommittees on Engery and Water Develoopment by the Assistant Secretary of the Army (Civil Works). Coordination with many local residents and local government officials started during the floodfight in April 1983. This contact provided insight into what the locals perceived as the needs of the area. They provided several levee plans that have been evaluated to provide protection from the flooding problems in the area.

COORDINATION WITH STATE AND OTHER FEDERAL AGENCIES

3. Key Federal and state agencies have been kept informed of plan development during the course of this study. Numerous informal meetings were held with the U. S. Fish and Wildlife Service during the course of this study to transfer information and discuss alternatives. This close coordination resulted in the development of a recommended levee plan that is environmentally acceptable and can be implemented without any significant impacts on the fish and wildlife resources of the area.

4. It was recognized from the beginning of this study that any plan developed by the Corps would be contingent upon the measures installed by the Louisiana Department of Transportation and Development (LDOT) at the highway crossings of I-10 and US 90-190. LDOT, working with the Federal Highway Administration (FHWA), initiated a study of the I-10 embankment with the U. S. Geological Survey (USGS) following the 1980 flood to determine what measures are needed

to alleviate the overtopping of the I-10 embankment. Results of this study indicate that a new 1,000-foot bridge span appears to be the best solution for this problem. Present studies are being conducted by USGS to determine what mitigation measures are needed at US 90-190; however, target backwater reductions for US 90-190 were provided to the Vicksburg District by LDOT (see Main Report, Attachment 1). Coordination meetings with LDOT, USGS, and FHWA were held in July 1983 and October 1984.

PUBLIC MEETINGS AND WORKSHOPS

5. A public meeting was held on 27 June 1984 in Slidell to present the Corps preliminary findings for local consideration and receive comments from the local people. The meeting was attended by approximately 500 persons with the vast majority supporting flood control. The Vicksburg District presented seven preliminary levee alignments that had been evaluated, of which only three were economically feasible. A representative of LDOT presented their findings to date. Following the presentation, considerable discussion centered around the adequacy of openings in I-10 and US 90 and location of levee alignments and borrow areas. Local residents expressed concern that onsite borrow areas would require too much of the remaining vacant land along each levee alignment and could pose a safety hazard because of their location adjacent to residential subdivisions.

6. A workshop was held in Pearlington, Mississippi, on 25 July 1984 to discuss the flooding problems in that area. The meeting was attended by approximately 50 residents of Pearlington who experienced the April 1983 flood. It was determined that only a few structures had actually been flooded. The Pearlington residents had two major concerns--that levees in Slidell would increase flood stages in Pearlington and that several of the local roads needed to be raised to provide Pearlington with adequate evacuation routes when flooding occurs on the East Pearl River. They expressed little desire for levees or any other flood protection measures for structures in the area. It was explained at this meeting that studies by the Vicksburg District show that levees in Slidell will have no measurable effect on river stages at Pearlington because very little storage would be removed from the very wide flood plain in this area. Also, the Corps would be unable to assist in the raising of state and county roads in Pearlington since the Corps has no authority for this type of work.

7. A final public meeting was held on 17 April 1985 in Slidell, Louisiana, to present the recommended plan to the public. Prior to this meeting, an information summary and public meeting notice were distributed to approximately 1,100 people, and coverage was provided by the news media. Approximately 300 people attended this meeting. Comments were received from almost 200 individuals. Of those responding, near unanimous support was received for the levee plan north of I-10 (Plan A), but many requests were made to the Vicksburg District to evaluate another levee plan south of I-10 (referred to as Plan J). This evaluation is included in the final report. Opposition to the proposed levee plans was voiced by several residents of Pearlington,

Mississippi, and Slidell, Louisiana, because of concern that levees in Slidell would raise river stages on the Pearl River. However, studies by the Vicksburg District show that levee Plans A and E (i.e., recommended plan) would not measurably increase flood stages on the Pearl River.

8. Since the April 1985 public meeting, two coordination meetings were held with the local sponsor, St. Tammany Parish Gravity Drainage District No. 3. In the second meeting held on 2 July 1985, the local sponsor was advised of our findings with regard to Plan J; i.e., Plan E is the best plan for the area south of I-10. In a letter dated 22 July 1985, the local sponsor expressed their willingness to fulfill the items of local cooperation as required for implementation of the recommended plan (see Main Report, Attachment 3).

COORDINATION OF THE DRAFT FEASIBILITY REPORT

REPORT DISTRIBUTION

9. The draft feasibility report for Slidell, Louisiana, and Pearlington, Mississippi, was disseminated on 18 March 1985 to various state and Federal agencies and local interests for review and comment. The draft report also included the draft Environmental Impact Statement, the Section 404(b)(1) Evaluation, and the Coastal Zone Management (CZM) Consistency Determination and as such, this coordination has complied with the requirements of the National Environmental Policy Act of 1969, the Clean Water Act of 1977, and the CZM Act of 1972. The tentatively selected plan (i.e., the recommended plan) presented in this report consists of a 15-mile levee system (Plans A and E) to provide 200-year flood protection to the Slidell area north and south of I-10. No plans were found to be economically feasible for the Pearlington, Mississippi, area. Federal, state, and local agencies who received this report are listed below.

a. Federal agencies.

- Environmental Protection Agency
- Department of Agriculture
    - Soil Conservation Service
    - Forest Service
    - Economic Research Service
- Department of Interior
    - U. S. Fish and Wildlife Service
    - U. S. Geological Survey
- Department of Commerce
    - Economic Development Administration
    - National Oceanic and Atmospheric Administration
- Department of Energy
- Department of Health and Human Services
- Department of Housing and Urban Development

Federal agencies (Cont)

Council on Environmental Quality
Federal Emergency Management Agency
Department of Transportation
    Federal Aviation Administration
    Federal Highway Administration
    U. S. Coast Guard
National Weather Service

b. State agencies.

Louisiana

Department of Health and Human Resources
Department of Transportation and Development
Office of Intergovernmental Relations
Department of Highways
Department of Agriculture
Department of Wildlife and Fisheries
State Parks and Recreation Commission
Department of Natural Resources
Department of Culture, Recreation, and Tourism
Attorney General
Department of Justice
State Planning Office
Louisiana State University
University of New Orleans
State Clearinghouse
    Regional Planning Commission
    Metropolitan Regional Planning Commission
Public Service Commission
Historic Preservation Office
Seaway Commission
Stream Control Commission
Water Resources Study Commission

c. Mississippi - state agencies.

Department of Natural Resources
State Clearinghouse
    Gulf Regional Planning Commission
    Southern Mississippi Planning and Development District
Department of Archives and History
Department of Agriculture and Commerce
Department of Energy and Transportation
Department of Wildlife Conservation

Mississippi - state agencies (Cont)

Emergency Management Agency
Forestry Commission
Public Service Commission
Research and Development Center
State Board of Health
State Highway Department
Soil and Water Conservation Commission
State Building Commission
Pearl River Valley Development District
Pearl River Basin Development District

d. Local agencies, institutions, and officials.

Louisiana

St. Tammany Parish Gravity Drainage District No. 3
Military Road Alliance
Mayor of Slidell
Mayor of Pearl River
St. Tammany Parish Police Jury
St. Tammany Parish Department of Engineering
Slidell Chamber of Commerce

Mississippi

Hancock County Board of Supervisors
Hancock County Port and Harbor Commission

e. Environmental and conservation organizations.

National Audubon Society
Orleans Audubon Society
Ducks Unlimited
National Water Resources Association
American Institute of Biological Sciences
Center for Urban Affairs
The Conservation Foundation
American Shore and Beach Preservation Association
American Public Works Association
American Planning Association
Ecology Center of Louisiana
Environmental Research Group
National Wildlife Federation
Louisiana Wildlife Federation
Mississippi Wildlife Federation
Advisory Council on Historic Preservation

Environmental and conservation organizations (Cont)

American Association for the Advancement of Science
League of Women Voters
Sierra Club
St. Tammany Sportsmen's League
Water Resources Institute of Mississippi
Mississippi Chapter of the Wildlife Society
Middle South Services, Environmental Affairs
Environmental Defense Fund
Wildlife Management Institute

COMMENTS AND RESPONSES

10. Copies of agency letters received by 13 May 1985 providing comments on the draft feasibility report, along with Vicksburg District responses, are provided on the following pages.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 8 1985

OFFICE OF
EXTERNAL AFFAIRS

Ms. Maryetta Smith
LMKPD-O
Vicksburg District, Corps of Engineers
U.S. Department of the Army
P.O. Box 60
Vicksburg, Mississippi 39180-0060

Dear Ms. Smith:

On March 21, 1985 this office received five copies of the draft Environmental Impact Statement (EIS) entitled: Slidell-Pearlington Flood Control Plan, Pearl River Basin, Pearl River, St. Tammany Parish, Louisiana and Hancock County, Mississippi.

Your agency requested comments on the EIS be received by May 9, 1985. In accordance with Section 1506.10 of the CEQ regulations (40 CFR 1500-1508), the 45 day review period will be calculated from the Federal Register notice dated March 29, 1985 and will extend until May 13, 1985.

If you have any questions, please contact Jan Lott Shaw of my staff on (202) 382-5074.

May I advise you to send a letter to all persons receiving the EIS informing them of the correct date and forward a copy of any such correspondence to this office.

Sincerely,

for Allan Hirsch
Director
Office of Federal Activities

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

MAY 07 1985

Lieutenant Colonel Kenneth L. Brown
Acting District Engineer
Vicksburg District
U.S. Army Corps of Engineers
P.O. Box 60
Vicksburg, Mississippi 39180-0060

Dear Colonel Brown:

We have completed our review of your Draft Feasibility Report and Environmental Impact Statement (EIS) for the Slidell, Louisiana and Pearlington, Mississippi flood control study.

The following comments are offered for your consideration:

1. In evaluating the levee alignment alternatives considered, we find the Selected Plan to be environmentally acceptable. It appears the levee construction and associated project features can be implemented without significant impact to the environmental resources affected.

2. Although it appears structural measures will provide the predominant flood reduction benefits for this proposal, the inclusion of specific nonstructural measures could provide additional benefits to the area and further reduce future flood related damages. Therefore, we offer the following recommendations:

    (a) The Corps should encourage the local sponsor to implement restrictive use zoning or non-development easements in the base floodplain.

    (b) The Corps should advise the sponsor as to the length of time the restrictive zoning must remain in effect and in how its use should be monitored.

    (c) The Corps should work with and encourage the appropriate Federal and state governmental agencies in the Slidell area to implement and enforce more restrictive floodplain zoning to further discourage any possible future base floodplain development.

3. On page EIS-22, Section 5.02(a), the Statement states that the material to be used for levee construction would be from an existing upland borrow site and would not contain contaminants. However, the 404(b)(1) Evaluation analysis presented on pages H-2(1.d.1) and H-3(1.d.3) provides very little description of the material or the borrow site location. This extent of assessment is acceptable provided there will be assurances that, if necessary, testing of the borrow material will be conducted prior to placement. The Final EIS should be more specific on the test and evaluation requirements and identify the measures to be taken to insure contaminant free fill placement.

4. It is not clear why the Corps elected to choose the 100-year protection design over the 200-year design with the difference in the benefit-to-cost ratios (1.35:vs:1.38) appearing to be negligible. Please clarify in the Final EIS.

We classify your Draft EIS as Lack of Objections (LO). Generally, we have no objections to the proposed action as discussed in the Draft EIS. However, we suggest the inclusion of the above mentioned nonstructural measures to supplement the overall flood reduction benefits and request other information as discussed in the above comments.

Our classification will be published in the Federal Register according to our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

We appreciate the opportunity to review the Draft EIS. Please send our office one (1) copy of the Final EIS at the same time it is sent to the Office of Federal Activities, U.S. Environmental Protection Agency, Washington, D.C.

Sincerely yours,

Dick Whittington

Dick Whittington, P.E.
Regional Administrator

United States
Department of
Agriculture

Soil
Conservation
Service

Suite 1321, Federal Building
100 West Capitol Street
Jackson, MS 39269

April 12, 1985

District Engineer
U. S. Army Engineer District, Vicksburg
Attn: LMK PD-Y
Post Office Box 60
Vicksburg, MS 39180-0060

Dear Sir:

The Slidell, Louisiana, and Pearlington, Mississippi, flood control study is a part of the ongoing Pearl River Basin study. The study area for the Slidell, Louisiana and Pearlington, Mississippi study includes only a very small area of Mississippi and the selected plan has no impact on the Mississippi area. Therefore, I have no comments for the study. However, as additional reports are prepared for the ongoing Pearl River Basin study, impacts on Mississippi will occur and I would appreciate the opportunity to review and comment on each study.

Sincerely,

A. E. Sullivan
State Conservationist

cc: Thomas N. Shiflet, Director of Ecological Sciences, SCS, Washington, D.C.

United States
Department of
Agriculture

Soil
Conservation
Service

3737 Government Street
Alexandria, LA 71302

April 26, 1985

Colonel Dennis J. York
Corps of Engineers
Vicksburg District
ATTN: LMKPL-Y
P. O. Box 60
Vicksburg, MS 39180-0060

Dear Colonel York:

We have reviewed the draft Main Report, Environmental Impact Statement, and Technical Appendixes for Slidell, LA and Pearlington, MS Interim Report on Flood Control. The EIS should address the impacts of levee construction on important agricultural lands. The levee rights-of-way required for the various alternative plans ranges from 58 to 126 acres.

The U. S. Department of Agriculture has published final rules for implementation of the Farmland Protection Policy Act (FPPA). Enclosed is a copy of the Act and the rules which became effective August 6, 1984. The purpose of the Act and rules is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. Section 658.4 describes the actions federal agencies are to take to comply with the rules. Enclosed is a copy of Form AD-1006. The FPPA is applicable only to actions by a federal agency.

Our Soil Conservation Service field office in St. Tammany Parish will provide assistance in complying with the FPPA. Gerald R. Cheveallier, District Conservationist, can provide additional information on specific soil types found along levee alignments. His office address is:

Soil Conservation Service
N. Florida and 33rd Streets
P. O. Box 159
Covington, LA 70433 Telephone: (504) 892-0853

Please call on us for additional assistance.

Sincerely,

Harry S. Rucker

Harry S. Rucker
State Conservationist

Enclosures

cc: Danny Clement, AC, SCS, Denham Springs
Gerald R. Cheveallier, DC, Covington

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW

Southeast Region / Suite 1360
Richard B. Russell Federal Building
75 Spring Street, S.W. / Atlanta, Ga. 30303

Telephone 404/221-4524 - FTS: 242-4524

May 6, 1985

ER-85/470

Colonel Dennis J. York, District Engineer
U. S. Army Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39810

Dear Colonel York:

We have reviewed the Draft Environmental Statement and Draft Feasibility Report, Flood Control, Pearl River Basin, Slidell, Louisiana, and Pearlington, Mississippi, and have the following comments.

General Comments

Extensive coordination between the Fish and Wildlife Service (FWS), Corps of Engineers (Corps), and the Louisiana Department of Wildlife and Fisheries (LDWF) has resulted in development of an environmentally acceptable plan for the project. The FWS planning aid report of June 5, 1984, described areas of environmental concern and presented recommendations to avoid, minimize, rectify, or reduce impacts in accordance with the FWS' mitigation policy. We are pleased that the cooperative attitude of the Corps has resulted in a selected plan which incorporates the FWS recommendations. Additional coordination with the LDWF, after the Corps' draft was completed, indicates that a boat ramp and parking area would also be needed at Gum Bayou to provide boat access which would be precluded by levee construction.

Summary Comments

The environmental statement is well written and adequately describes the impacts of the project on fish and wildlife resources. We have no objection to implementation of the selected plan as currently proposed, provided that a boat ramp and parking area at Gum Bayou are constructed as a project feature.

Thank you for the opportunity to comment on this report.

Sincerely,

James H. Lee

James H. Lee
Regional Environmental Officer

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

April 17, 1985

Mr. Mike Harden
District Engineer
U.S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
Post Office Box 60
Vicksburg, Mississippi 39180-0060

Dear Mr. Harden:

This is in reference to your draft environmental impact statement for Pearl River Basin Flood Control Study Project. Enclosed are comments from the National Oceanic and Atmospheric Administration.

We hope our comments will assist you. Thank you for giving us an opportunity to review the document. We would appreciate receiving four copies of the final environmental impact statement.

Sincerely,

David Cottingham
for
Joyce M. Wood
Chief, Ecology and
Conservation Division

Enclosure

DC:lg

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

Recd
[illegible]

April 12, 1985 F/SER11:CF

JC
4-17.

TO: PP2 - Joyce Wood

FROM: F/SER11 - Richard J. Hoogland

SUBJECT: DEIS 8503.12 - Pearl River Basin Flood Control Study Project, Slidell, Louisiana, and Pearlington, Mississippi

The National Marine Fisheries Service has reviewed the subject document as requested in your March 26, 1985, memorandum. We anticipate that any adverse effect that might occur on marine and anadromous fishery resources would be minimal and, therefore, do not object to the development plan.

cc:
F/M42
F/SER112
GMFMC
COE, Vicksburg District

U.S. Department of Housing and Urban Development
Fort Worth Regional Office, Region VI
221 West Lancaster
Fort Worth, Texas 76113

April 22, 1985

Lieutenant Colonel Kenneth L. Brown
Acting District Engineer
Vicksburg District, Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39160-0060

Dear Colonel Brown:

SUBJECT: Review of Draft Environmental Impact Statement
Pearl River Basin, Slidell, LA, and Pearlington, MS
On Flood Control, dated March 1985

The subject Draft Environmental Impact Statement for the Pearl River Basin, Slidell, LA, and Pearlington, MS, has been reviewed by our New Orleans Office.

This document adequately reflects the views of this Regional Office. Therefore, in accordance with Council of Environmental Quality regulations, Section 1503.2, we submit a "no comment" reply to the subject statement.

We do wish to point out, however, that the "tentatively selected plan," would cause increased flooding on the river side of the levee alignment which would include Pearlington. The statement does not indicate what mitigation measures, if any, are planned in connection with the reduced floodplain capacity.

We appreciate the opportunity to review the subject Draft EIS.

Sincerely,

Ramsbottom

I. J. Ramsbottom
Environmental Clearance Officer

U.S. Department of Housing and Urban Development
Atlanta Regional Office, Region IV
Richard B Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303-3388

April 17, 1985

Mr. Kenneth L. Brown
Lieutenant Colonel
District Engineer
US Army Engineering District
ATTN: LMKPD-Y
Post Office Box 60
Vicksburg, MS 39180-0060

Dear Mr. Brown:

Thank you for the opportunity to review and comment on the draft feasibility report, flood control study and Draft Environmental Impact Statement (DEIS) for Pearl River Basin.

We have no objections to the DEIS. It is unfortunate that plans for flood control measures in the Pearlington, Mississippi area cannot be implemented. However, the plans to mitigate flooding in the Slidell, Louisiana area will provide much needed relief to a large segment of that community.

Sincerely,

Buddy E Arbuckle

for Ivar O. Iverson
Regional Environmental Officer

Federal Emergency Management Agency

Region VI, Federal Center, 800 North Loop 288
Denton, Texas 76201-3698

April 2, 1985

NH

District Engineer
U. S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
P. O. Box 60
Vicksburg, MS 39180-0060

Dear Sir:

We have received and reviewed the draft feasibility report for Slidell, Louisiana, and Perlington, Mississippi, flood control study. FEMA appreciates the opportunity to learn of potential flood control projects. While reviewing the document, it became apparent that the Corps of Engineers devoted time to understand and comply with the intent of the National Flood Insurance Program.

Because the New Orleans District Corps of Engineers is conducting FEMA flood study efforts in St. Tammany Parish, we would request, if not already done, that this data be coordinated or shared with them. This type of information could possibly prove valuable in their study efforts.

Again, thank you for the information. Please keep us informed as to project progress. If we can provide you with any floodplain management assistance, please contact our office.

Sincerely,

Wayne Fairley

Wayne Fairley
Community Planner
Natural Hazards Branch
Natural and Technological
Hazards Division

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
P. O. BOX 3929
BATON ROUGE, LOUISIANA 70821

REGION 6

April 18, 1985

IN REPLY REFER TO
Draft Main Report, EIS
Pearl River Basin
Slidell, Louisiana, and
Pearlington, Mississippi
Flood Control

District Engineer
U.S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
Post Office Box 60
Vicksburg, Mississippi 39180-0060

Dear Sir:

We appreciate the opportunity to comment on the proposed action. It is noted that there has been coordination between the Corps, LDOTD and FHWA on modifications to I-10 and US-90. We urge continued coordination on any aspects of the proposed action that may have effects on highways.

Sincerely yours,

Donald P. Steinke

for: J. N. McDonald
Division Administrator

U.S. Department
of Transportation
**United States
Coast Guard**

COMMANDER
EIGHTH COAST GUARD DISTRICT
HALE BOGGS FEDERAL BLDG.

500 CAMP ST.
NEW ORLEANS, LA. 70130
STAFF SYMBOL: (dpl)
PHONE: FTS 682-2961
504-589-2961

From: Commander, Eighth Coast Guard District

16475
19 April 1985

District Engineer
U. S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
P. O. Box 60
Vicksburg, MS 39180-0060

Subj: DRAFT MAIN REPORT AND EIS: PEARL RIVER BASIN, SLIDELL, LA AND PEARLINGTON, MS, INTERIM REPORT ON FLOOD CONTROL

1. We have reviewed the subject document and have no comments concerning this report. Thank you for the opportunity to participate in the review process.

TW Rolston
T. W. ROLSTON
By direction

U.S. Department
of Transportation
**United States
Coast Guard**

Commandant
United States Coast Guard

Washington, DC 20593
Staff Symbol: G-WP-1
Phone: (202) 426-9584

08
MAY 1 1985

Lieutenant Colonel Kenneth L. Brown
Acting District Engineer
U. S. Army Engineer District, Vicksburg
Attn: LMKPD-Y
Post Office Box 60
Vicksburg, MS 39180-0060

Dear Colonel Brown:

The concerned operating administrations of the Department of Transportation have reviewed the draft feasibility report and draft environmental impact statement for Slidell, Louisiana, and Pearlington, Mississippi, flood control study.

The opportunity to review the flood control study is appreciated.

Sincerely,

R. H. Brundage, for
J. G. SCHMIDTMAN
Captain, U.S. Coast Guard
Chief, Planning and Evaluation Staff
By direction of the Commandant

Department of Transportation and Development

P. O. BOX 44245 CAPITOL STATION
BATON ROUGE, LA. 70804

Robert G. Graves
Secretary

Edwin W. Edwards
Governor

(504) 342-7542

April 19, 1985

District Engineer
U.S. Army Engineer District, Vicksburg
P.O. Box 60
Vicksburg, Mississippi 39180-0060

ATTENTION: LMKPD-Y

RE: Pearl River Basin Slidell, LA and Pearlington, MS
Interim Report on Flood Control (Draft dated
March 1985)

Dear Sir:

We have reviewed the referenced document concerning the proposed project and have the following comments to offer:

1) It is imperative that close coordination be continued throughout project development with the Department. This is especially true in light of the fact that interstate and state highway facilities have played and will continue to play a major role in this project's development.

2) A permit will be required from this Department's Maintenance Section for any work to be performed within Department of Transportation and Development's right-of-ways. The contact person is:
Mr. P. J. Frederick
Louisiana Department of Transportation and Development
Chief, Maintenance and Operations Engineer
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

We appreciate the opportunity to review this document and any questions concerning this review can be directed to this Section.

Sincerely,

V. Pizzolato

VINCENT PIZZOLATO
PUBLIC HEARINGS AND
ENVIRONMENTAL IMPACT ENGINEER

VP/GJD/mw
cc: Mr. Neil Wagoner
Mr. Charles Higgins
Mr. Frank Heroy, Jr.
Mr. Harvey Shaffer
Mr. P. J. Frederick
Mr. Henry Barrouse
Mr. James Forbes
FHWA

Department of Transportation and Development

P. O. BOX 1709
HAMMOND, LA. 70404

Robert G. Graves
Secretary

Edwin W. Edwards
Governor

May 6, 1985

Col. Dennis J. York
District Engineer
U. S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
P. O. Box 60
Vicksburg, Mississippi 39180-0060

Re: Slidell-Pearlington Flood
Control Study

Dear Col. York:

The draft feasibility report for Slidell, Louisiana and Pearlington, Mississippi Flood Control Study has been received by this office and we make the following comments and observations.

The tentatively selected plan which involves protected areas both north and south of Interstate 10 in Slidell, Louisiana addresses the major concerns from a flood control standpoint and environmental assessment. The plan appears to be feasible and will provide flood protection for most of the areas previously flooded from the Pearl River.

We appreciate the opportunity to make this review and offer our comments. We would like to request that you continue to furnish us with the developments of this flood protection plan.

Yours very truly,

MERLIN A. PISTORIUS
DISTRICT ADMINISTRATOR

MAP:vw

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA 70895

J BURTON ANGELLE, SR
SECRETARY
(504) 925-3617

EDWIN W EDWARDS
GOVERNOR

April 3, 1985

District Engineer
U. S. Army Engineer District, Vicksburg
P. O. Box 60
Vicksburg, Mississippi 39180-0060

Dear Sir:

We have initiated our reviews of the Pearl River Basin Flood Control Report, and although these are as yet incomplete, we have noted that there are no provisions to allow access to Gum Bayou following construction of a proposed pumping station and flood gate in that area.

Personnel at our Pearl River Management Area have pointed out that Gum Bayou periodically has a problem with excessive growth of water hyacinths and that this necessitates regular chemical spraying by our Department for control. We have some concern that the installation of a control structure at the bayou may possibly worsen the hyacinth problem and could result in severe restrictions of recreational uses of the bayou in areas upstream of the control structure. We believe this could be fairly easily remedied by the installation of a launching site on the bayou that would at least provide access to upstream areas for small boats.

Members of our staff can be made available to meet with your representatives and, if desired, can conduct them on a tour of the Gum Bayou area to better acquaint them with potential problems. They may wish to contact either Mr. Chuck Killebrew or Mr. Norman Stafford at our main office in Baton Rouge at (504) 342-9273.

Sincerely yours,

J. Burton Angelle

J. Burton Angelle
Secretary

JBA/CJK/fsb

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA 70895

J. BURTON ANGELLE, SR
SECRETARY
(504) 925-3617

EDWIN W. EDWARDS
GOVERNOR

July 22, 1985

Colonel Pat M. Stevens, IV
District Engineer
U. S. Army Corps of Engineers
P. O. Box 60
Vicksburg, Mississippi 39180

Re: Pearl River Basin
Slidell, Louisiana and Pearlington, Mississippi
Interim Report on Flood Control

Dear Colonel Stevens:

Personnel of our technical staff have reviewed the draft report and EIS for the above referenced project which presents the results of studies of flooding in the Slidell, Louisiana area and analyzes possible alternative solutions to resolve flood problems.

Department personnel have participated in various stages of interagency coordination involving a series of meetings, including a public hearing, and the field surveys necessary to assess and evaluate potential project impacts to fish and wildlife habitats and resources.

During our preliminary reviews we stated our concerns with the proposed installation of a control structure at Gum Bayou which could aggravate an existing problem with excessive growth of water hyacinths, and restrict recreational uses of the bayou. To alleviate these potential problems, we have recommended the installation of a boat launching site on the bayou to provide access to upstream areas, both for hyacinth control and recreational use purposes. We have also pointed out that Morgan River is a Louisiana Natural and Scenic Stream and maintenance of riparian areas west of the river could necessitate some realignment of a segment of the proposed levee which would parallel it. Beyond these considerations our general concern has been with the need to incorporate in project planning provisions which would, to the extent possible, protect and maintain aquatic and terrestrial habitats and the commercial and recreational productivity of those portions of the lower Pearl River Basin which could be affected, either directly or indirectly, by flood control measures. However, based upon our review of the array of possible flood control projects discussed in the report, and particularly of those which propose structural measures, we are generally satisfied that the system of levees, pumping stations, and sump areas presented in the tentatively selected plan would best satisfy the objectives of flood control, and protection of fish and wildlife habitats and resources in the project area.

We appreciate the opportunity to review the draft report/EIS.

Sincerely yours,

J. Burton Angelle
Secretary

JBA:CJK:sd

State of Louisiana

EDWIN W. EDWARDS
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

B. JIM PORTER
SECRETARY

April 18, 1985

Colonel Dennis J. York
District Engineer
U.S. Army Engineer District, Vicksburg
Attn: LMKPD-Y
P. O. Box 60
Vicksburg, Mississippi 39180-0060

RE: C850144
Consistency determination
Pearl River Basin
Slidell, LA and Pearlington, MS
Interim report on flood control

Dear Colonel York:

This office has reviewed the above referenced consistency determination in accordance with the Coastal Zone Management Act of 1972, Section 307 (C) (1) and the NOAA Regulations on Federal Consistency with Approved Coastal Management Programs 15 CFR 930 Subpart C. At this time we cannot find this action consistent to the maximum extent practicable until several issues which we feel have not been adequately addressed have been answered.

Specifically, your response to guideline 2.1 concerning the impacts of levee construction on wetlands indicates that 8 acres of wetlands will be directly impacted. However, a review of the project by the Habitat Evaluation Procedure only assesses the terrestrial portions of the Study area and does not address the impacts on wetlands as described in the Environmental Analysis Section Appendix F. Before a final consistency determination can be made a more accurate picture of the impacts to Louisiana's coastal zone wetlands should be presented. A review of the Environmental Assessment does not show a breakdown by wetland type of the area to be disturbed. We feel that this information will be necessary in order to properly evaluate this project.

Once these issues have been clarified we will be better able to make a consistency determination for what we consider a well designed and worthwhile project. If you have any questions concerning this matter, please contact Mr. Frank Monteferrante of my staff who will be glad to assist you.

Sincerely,

CGGroat

C. G. Groat
Assistant to the Secretary

CGG/FM/dg
cc: Peter Tweedt

State of Louisiana

Department Of Culture, Recreation And Tourism
Office Of Cultural Development
Robert B. DeBlieux
Assistant Secretary

Edwin W. Edwards
Governor
Noelle LeBlanc
Secretary

Division Of Archaeology
Kathleen Byrd, Director
Division Of The Arts
Albert B. Head, Director
Division Of Historic Preservation
Ann Reiley Jones, Director
Folklife Program
Nicholas R. Spitzer,
Program Manager

April 24, 1985

District Engineer
U. S. Army Engineers
District, Vicksburg
ATTN: LMKPD-Y
P. O. Box 60
Vicksburg, MS 39180-0060

Re: Draft Main Report, Environmental Impact
Statement and Technical Appendixes
Slidell, Louisiana, and Pearlington,
Mississippi, Flood Control Study

Dear Sir:

Reference is made to your letter of March 19, 1985, requesting our review of the above document. Our review indicates that project impact on cultural resources has been satisfactorily addressed up to this point. We would recommend, however, that in the reference section for Appendix F, the reference for the cultural resources survey report prepared for the project by Heartfield, Price and Greene, Inc. be included.

If we may be of further assistance, do not hesitate to contact my staff in the Division of Archaeology.

Sincerely,

Robert B. DeBlieux
State Historic Preservation Officer

RBD:PGR:tb

State of Louisiana
Department of Urban and Community Affairs
Office of State Clearinghouse

EDWIN W. EDWARDS
GOVERNOR
DOROTHY M. TAYLOR
SECRETARY

March 26, 1985

Kenneth L. Brown
Lieutenant Colonel
Acting District Engineer
Vicksburg District, Corps of Engineers
Post Office Box 60
Vicksburg, Mississippi 39180-0060

Dear Lieutenant Colonel Brown:

This will acknowledge receipt of your draft of the feasibility report/ Environmental Impact Statement for Slidell, Louisiana and Pearlington, Mississippi.

Thank you for affording the Office of State Clearinghouse an opportunity to review this plan.

We are not aware of any unfavorable comments by other reviewing agencies, and hereby consider the requirements of this office to have been met pursuant to E.O. 12372.

If you have any questions, or if I can provide further information, please do not hesitate to contact me.

Sincerely,

Ferguson S. Brew
Single Point of Contact

FSB/DM/dap

xc: Mr. Dan Hawkins, DUCA/Floodplain Management

STATE OF MISSISSIPPI
DEPARTMENT OF ARCHIVES AND HISTORY
P O BOX 571
JACKSON MISSISSIPPI 39205-0571

BOARD OF TRUSTEES
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SHERWOOD W WISE

ELBERT R HILLIARD
DIRECTOR

March 28, 1985

District Engineer
U.S. Army Engineer District, Vicksburg
ATTN: LMKPD-Y
P. O. Box 60
Vicksburg, Mississippi 39180-0060

RE: Draft Main Report, EIS and Technical Appendixes for the Pearl River Basin, Slidell, Louisiana, and Pearlington, Mississippi, Interim Report on Flood Control (March 1985)

Dear Sirs:

We have reviewed the above document. We concur with the assessment for known sites and potentially eligible sites as described in pages F10-F12. Should any eligible site be impacted in the final design, our comments should be sought as to the project's effect under 36 CFR 800.

Thank you for allowing us to comment.

Sincerely,

ELBERT R. HILLIARD
State Historic Preservation Officer

Roger G. Walker

By: Roger G. Walker
Interagency Coordinator

RGW/gj

cc: Clearinghouse for Federal Programs

Pearl River Basin Development District
An Independent Agency of the State of Mississippi
2304 Riverside Drive P. O. Box 5332 Jackson, Mississippi 39216-1332 (601) 354-6301

Mike Davis, Executive Vice President

April 16, 1985

Colonel Dennis York, District Engineer
U. S. Army Corps of Engineers
Vicksburg District
Attention: LMKPD-Y
P. O. Box 60
Vicksburg, Miss. 39180

Dear Colonel York:

The Pearl River Basin Development District is a special-fund state agency which serves as local sponsor for flood control projects within the Pearl River Basin. Fifteen member counties comprise our agency and we are concerned with flooding along the Pearl River from Philadelphia to Carthage, Jackson, Monticello, Columbia, and Pearlington. We have conducted many flood control studies and have assisted both the Mobile District and the Vicksburg District in their studies to help identify flood control projects that will serve their purpose and are capable of passing the ominous benefit cost criteria which unfortunately leaves many flood projects economically unfeasible.

It seems that this is the case for those living in Pearlington, Miss. Apparently there are no flood control projects which could be constructed to help alleviate flooding in Pearlington and yet have a favorable benefit cost ratio.

We are also concerned with the loss of flows from the lower East Pearl River to the West Pearl River which is partially attributable to the diversion of water at such locations as Wilson's Slough, Holmes Bayou and Farr's Slough. The Pearl River Basin Development District supports the Mississippi Attorney General's efforts to reclaim flows along the East Pearl River. The Pearl River Basin Development District recommends that the U. S. Army Corps of Engineers consider the positive effects in the Slidell area of increasing flows along the East Pearl River. A study should be conducted by the Corps of Engineers to see how much additional water could be passed along the East Pearl but yet not cause additional flood problems to the area of Pearlington and other communities in Mississippi. It seems reasonable that the return of flows to the East Pearl River would help reduce the magnitude of flooding in the Slidell area. More water passing down the East Pearl River should mean lower stages on the West Pearl River during flood times. This of course is not the total solution to the flooding problem but it appears that it would have some positive benefits to both Mississippi and Louisiana.

In conclusion, the Pearl River Basin Development District recommends that the Corps of Engineers include in its Slidell-Pearlington Flood Control Study the benefits to be derived by returning flows to the East Pearl River.

Sincerely,

Mike Davis

Mike Davis
Executive Vice President

MD:ss

144 Rue Acadian
Slidell, Louisiana 70458

May 13, 1985

Department of the Army
Col. Dennis J. York
District Engineer
Vicksburg District
P. O. Box #60
Vicksburg, Mississippi 39180 - 0060

Dear Col York:

I offer my apologies for lack of an earlier response to your March 18th letter.

A consensus, amongst the members of the Military Road Alliance, shows solid complimentary acknowledgement toward the extent and depth of research conducted by the Corps of Engineers. The report is entirely comprehensive in detail and practical in nature.

The matter, as it now stands, is this:

1. Plan "A" has been received with general approval by members of the M.R.A. Flood Committee and our membership in general.
2. Plan "E" provides complexities in the nature of presentability for local sponsorship. This portion of the project does not offer the very visible merits of Plan "A" in the eyes of the public. This last, is a reflection of the expense/expanse and experience to be assimulated by voters to gain formal approval.

Again, my high compliments for the very credible report.

Yours very truly,

E. C.

Captain E. C. Savage,
President - Military Road
Alliance

ECS/am

CC: Dr. Stan Owen - M.R.A. Flood Committee

HONEY ISLAND GROUP
SIERRA CLUB
St. Tammany – Washington Parishes
Louisiana

Col. Dennis York
District Engineer
U. S. Army Corps of Engineers
Vicksburg District, Vicksburg MS 39180

Dear Colonel York:

We have read with great interest the initial results of the Slidell, Louisiana, and Pearlington, Mississippi, Flood Control Study. In general, the Honey Island Group of the Sierra Club supports the results of this study.

We were pleased to find that offsite borrow was found to be feasible and that this method of supplying the necessary levee embankment material will be used. We feel that this will result in significantly less damage to the local environment and reduce the disruption the levee will cause to the landowners in the area.

The Sierra Club feels that improvements to the drainage under the I-10 embankment will help alleviate flooding north of the interstate without significantly affecting areas south of the interstate. We are pleased that the construction of the levee - which we understand was designed assuming increased drainage under the interstate - will not discourage plans to improve drainage through the interstate embankment.

We look forward to maintaining our contact with you and your staff as plans for the levee progress.

Sincerely,

Alex Ciegler

Alex Ciegler
Co-Chairman
Honey Island Group Sierra Club
200 Nottingham Lane
Slidell, La. 70461

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

Beverly W. Hogan
Executive Director
Federal-State Programs

Sandra B. Irby
Director
Department of Planning and Policy

MEMORANDUM

TO: Department of the Army
Vicksburg District, Corps of Engineers
P. O. Box 60
Vicksburg, MS 39180-0060

DATE: 4-11-85

FROM: STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

SUBJECT: REVIEW COMMENTS
Activity: Draft feasibility report for Slidell, LA and Pearlington, MS flood control study and also a draft environmental impact statement.

State Application Identifier Number:
MS850320-006

Location: Warren Co./Central

Contact:

The State Clearinghouse, in cooperation with state agencies interested or possibly affected, has completed the review process for the activity described above.

INTERGOVERNMENTAL REVIEW PROCESS COMPLIANCE:

( ) We are enclosing the comments received from the state agencies for your consideration and appropriate action. The remaining agencies involved in the review did not have comments or recommendations to offer at this time. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) Conditional clearance pending Archives and History's approval.

(x) None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) The review of this activity is being extended for a period not to exceed 60 days from the receipt of notification to allow adequate time for review.

COASTAL PROGRAM COMPLIANCE (Coastal area activities only):

( ) The activity has been reviewed and complies with the Mississippi Coastal Program. A consistency certification is to be issued by the Bureau of Marine Resources in accordance with the Coastal Zone Management Act.

( ) The activity has been reviewed and does not comply with the Mississippi Coastal Program.

( ) Not Applicable.

cc: Funding Agency (As requested by agency)

RESPONSE TO AGENCY LETTERS

1. U. S. Environmental Protection Agency, Washington, D. C., dated 8 April 1985.

Comment acknowledged. All persons receiving the draft EIS were advised of the extended review time.

2. U. S. Environmental Protection Agency, Region VI, Dallas, Texas, dated 7 May 1985.

a. Concur. As a part of the requirements of local cooperation that must be fulfilled prior to initiation of construction, the local sponsor must prescribe and enforce zoning regulations to prevent obstruction or encroachment which would reduce the project's flood-carrying capacity or hinder maintenance and operation, and control development in the project area to prevent undue increases in the flood damage potential. In addition, the local sponsor must publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

b. Concur. All restrictive zoning must remain in effect for the project life estimated at 100 years. The local sponsor will be so advised.

c. Concur. See response a above.

d. Existing data related to fill material for levee construction has been reviewed and there was no record of contaminant problems at any of the existing commercial borrow pits located near the project area. Therefore, no further testing is proposed at this time.

e. The tentatively selected plan (i.e., recommended plan) is the 200-year levee design.

3. Soil Conservation Service, Jackson, Mississippi, dated 12 April 1985.

Comment acknowledged.

4. U. S. Department of Agriculture, Soil Conservation Service, Alexandria, Louisiana, dated 26 April 1985.

Comment acknowledged. In accordance with the Farmland Protection Policy Act of 1984 (FPPA), the Farmland Conversion Impact Rating Form (Form AD-1006) was provided to Mr. Gerald Cheveallier, District Conservationist, Covington, Louisiana, in a letter dated 28 May 1985. Based on the guidelines contained in the FPPA and further coordination with SCS, the Vicksburg District assumes that the implementation of the recommended plan will be in compliance with this Act.

5. U. S. Department of the Interior, Office of Environmental Project Review, Atlanta, Georgia, dated 6 May 1985.

A boat-launching ramp landside of the levee on Gum Bayou is included in the final report as a part of the recommended plan. This boat-launching ramp is needed to provide access for general maintenance of the pump facilities, inlet channels, sump areas, and for the State of Louisiana, Department of Wildlife and Fisheries to continue regular chemical spraying for controlling of water hyacinths in Gum Bayou. This ramp may have some incidental recreation use, but will not include designated parking facilities.

6. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of the Administrator, Washington, D. C., dated 17 April 1985, and enclosure from National Marine Fisheries dated 12 April 1985.

Comment acknowledged.

7. U. S. Department of Housing and Urban Development, Fort Worth Regional Office, Fort Worth, Texas, dated 22 April 1985.

Hydrologic studies by the Vicksburg District show that the tentatively selected plan (i.e., the recommended plan) would have no measurable impact on flood stages in Pearlington, Mississippi. The area the recommended levee plans protect is not a part of the effective flow area of the river and serves only as a shallow storage area for backwater flooding. The flood plain of the East and West Pearl Rivers is approximately 4.5 miles wide, and the levees would remove such a small amount of the backwater storage area that the impact on river stages would be immeasurable.

8. U. S. Department of Housing and Urban Development, Atlanta Regional Office, Atlanta, Georgia, dated 17 April 1985.

Comment acknowledged.

9. Federal Emergency Management Agency, Region IV, Denton, Texas, dated 2 April 1985.

Comment acknowledged. Copy of draft report was furnished to New Orleans District, Corps of Engineers.

10. U. S. Department of Transportation, Federal Highway Administration, Baton Rouge, Louisiana, dated 18 April 1985.

Comment acknowledged.

11. U. S. Department of Transportation, U. S. Coast Guard, Commander, Eighth Coast Guard District, New Orleans, Louisiana, dated 19 April 1985.

Comment acknowledged.

12. U. S. Department of Transportation, U. S. Coast Guard, Commandant, Washington, D. C., dated 1 May 1985.

Comment acknowledged.

13. Louisiana Department of Transportation and Development, Public Hearings and Environmental Impact Engineer, Baton Rouge, Louisiana, dated 19 April 1985.

Comment acknowledged.

14. Louisiana Department of Transportation and Development, District Administrator, Hammond, Louisiana, dated 6 May 1985.

Comment acknowledged.

15. State of Louisiana, Department of Wildlife and Fisheries, dated 3 April 1985.

A boat-launching ramp landside of the levee on Gum Bayou is included in the final report as a part of the recommended plan. This boat-launching ramp is needed to provide access for general maintenance of the pump facilities, inlet channels, sump areas, and for the State of Louisiana, Department of Wildlife and Fisheries to continue regular chemical spraying for controlling of water hyacinths in Gum Bayou. This ramp may have some incidental recreation use, but will not include designated parking facilities.

16. State of Louisiana, Department of Wildlife and Fisheries, dated 22 July 1985.

Comment acknowledged. A boat-launching ramp landside of the levee on Gum Bayou is included in the final report as a part of the recommended plan. This boat-launching ramp is needed to provide access for general maintenance of the pump facilities, inlet channels, sump areas, and for the State of Louisiana, Department of Wildlife and Fisheries to continue regular chemical spraying for controlling of water hyacinths in Gum Bayou. This ramp may have some incidental recreation use, but will not include designated parking facilities.

17. State of Louisiana, Department of Natural Resources, dated 18 April 1985.

a. The Habitat Evaluation Team included Corps of Engineers, FWS, and LDWF biologists. The HEP team reviewed a number of wildlife species models which included wetland-related species. The consensus of the team was that the species selected for evaluation purposes were representative. A review of HEP is presented in Appendix F, pages F-14, F-15, and F-35, and in the FWS Coordination Act Report, Appendix G.

b. The 8 acres of wetlands directly impacted by the recommended plan are classified as water tupelo-swamp tupelo in accordance with the Society of American Foresters Classification. The types of wetlands impacted by the various alternatives are presented in Tables F-6. To clarify the wetland type concern, the types of wetlands have been duly noted throughout the report, and a generalized vegetation map has been included (see Plate J-52).

18. Louisiana Department of Culture, Recreation, and Tourism, Office of Cultural Development, Baton Rouge, Louisiana, dated 24 April 1985.

Comment acknowledged. The appropriate cultural resource survey was included in the reference section for Appendix F.

19. State of Louisiana, Department of Urban and Community Affairs, Baton Rouge, Louisiana, dated 26 March 1985.

Comment acknowledged.

20. State of Mississippi Department of Archives and History, Jackson, Mississippi, dated 28 March 1985.

Comment acknowledged.

21. Pearl River Basin Development District, Jackson, Mississippi, dated 16 April 1985.

During major flood events, the entire 4.5-mile-wide Pearl River Basin flood plain becomes inundated. Therefore, the implementation of a structure or other measures to divert low flows down the East Pearl River would have no significant impact on reducing the flood stages along the West Pearl River (i.e., no flood control benefits would be derived from diverting low flows down the East Pearl River).

22. President, Military Road Alliance, Slidell, Louisiana, dated 13 May 1985.

Comments acknowledged.

23. Honey Island Group Sierra Club, St. Tammany - Washington Parishes, Slidell, Louisiana, undated.

Comment acknowledged.

24. State of Mississippi, State Clearing House for Federal Programs, dated 4 April 1985.

Comment acknowledged.

SLIDELL, LOUISIANA, AND PEARLINGTON, MISSISSIPPI

APPENDIX J

PERTINENT PLATES

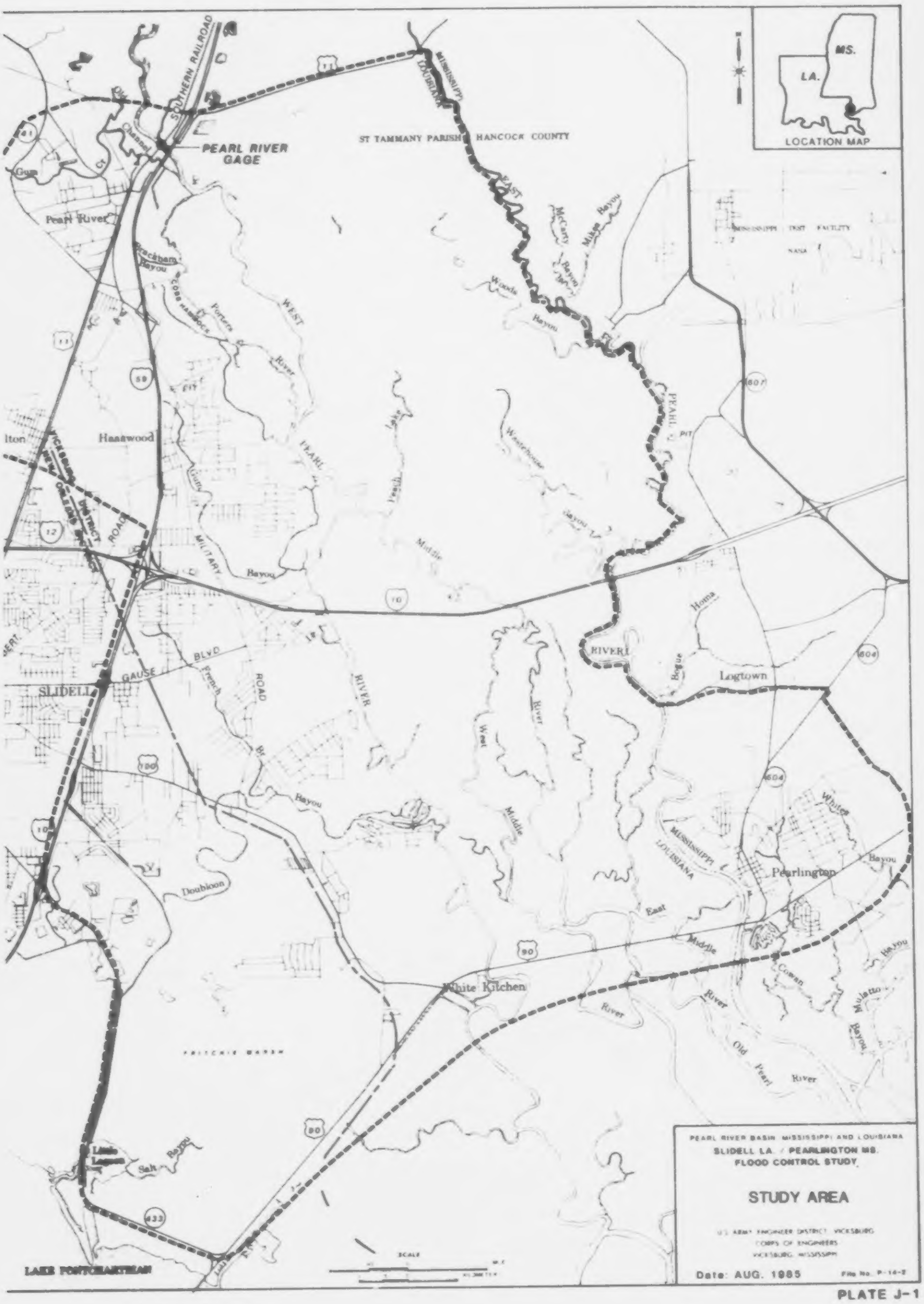
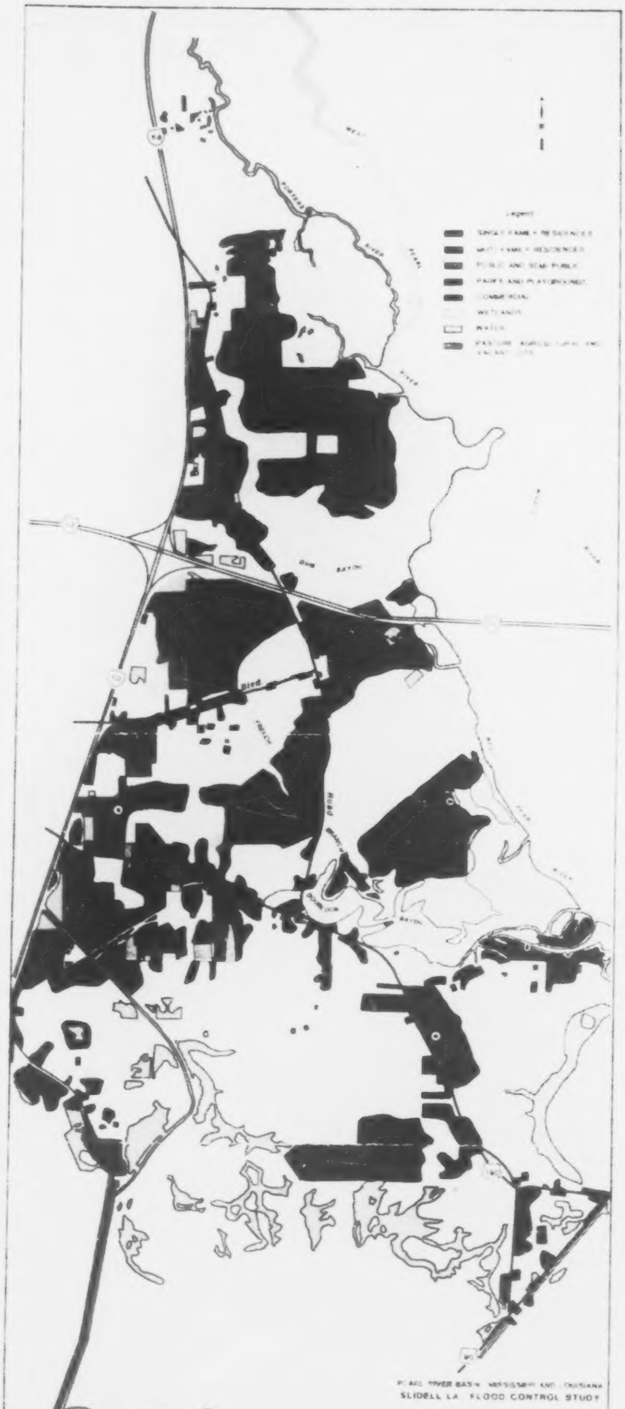


PLATE J-1



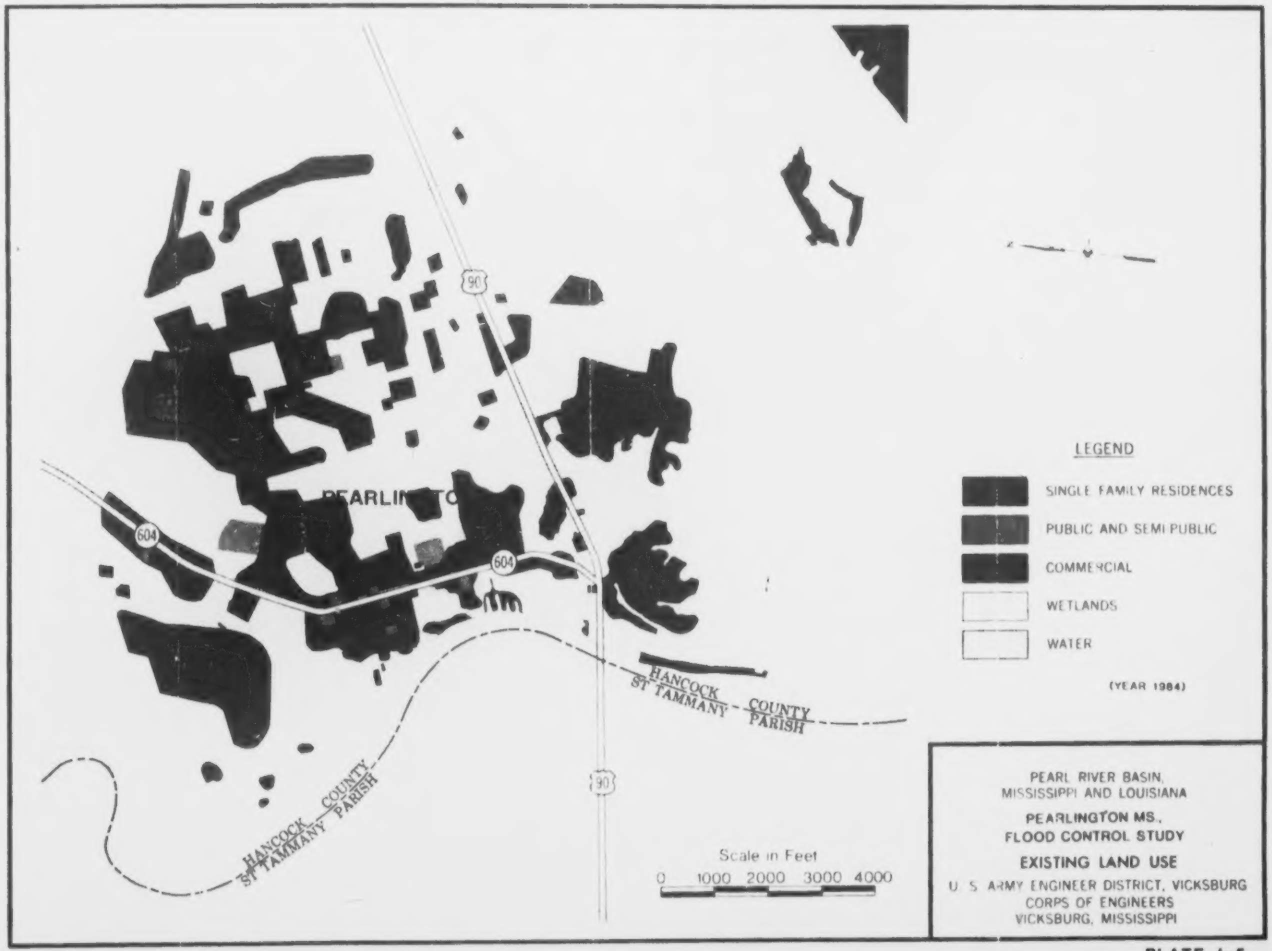
PEARL RIVER BASIN, MISSISSIPPI AND LOUISIANA
SLIDELL LA. FLOOD CONTROL STUDY

EXISTING LAND USE
(YEAR 1984)

U.S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

File No. P 14 2

PLATE J-4



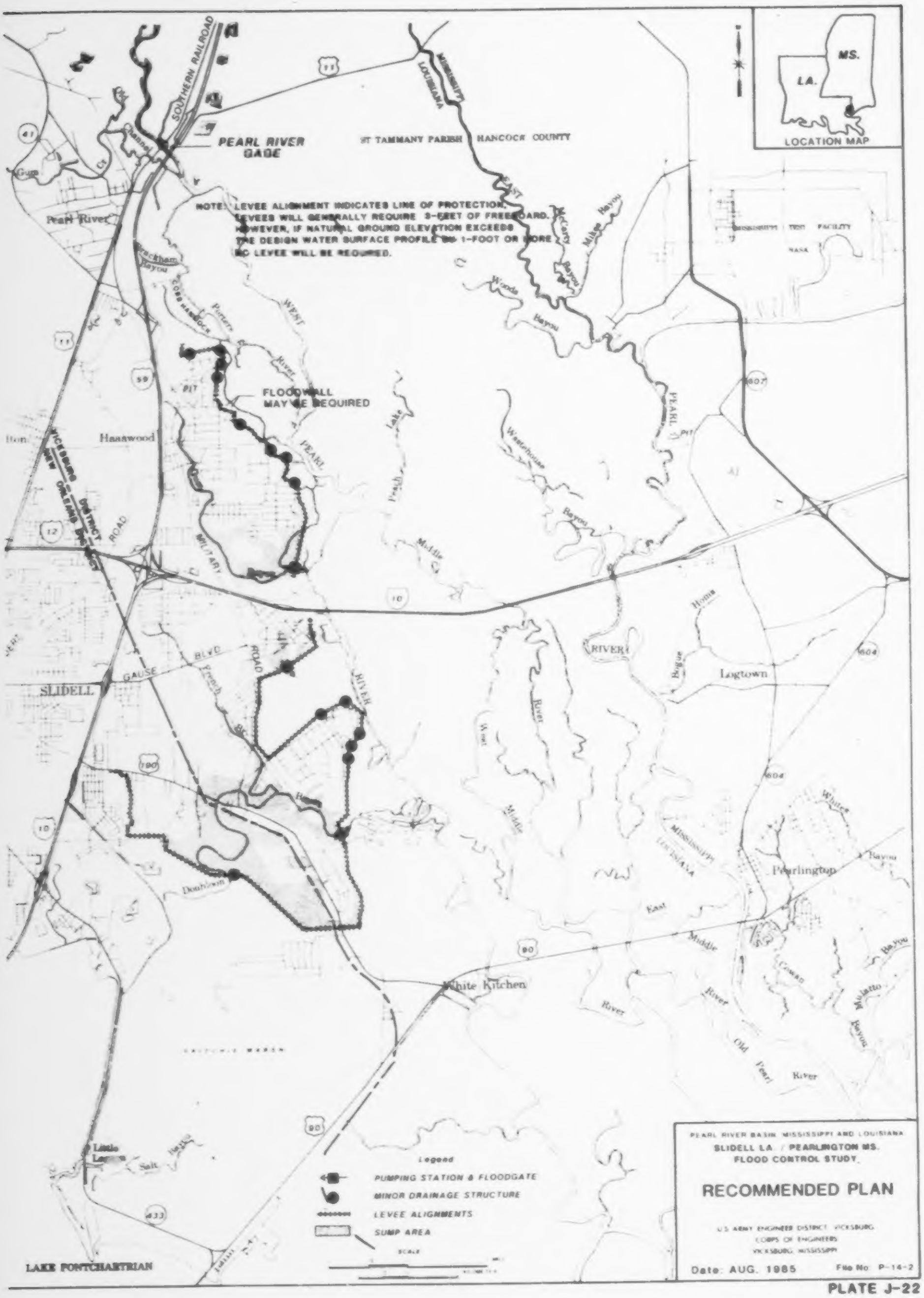
PEARL RIVER BASIN,
MISSISSIPPI AND LOUISIANA

PEARLINGTON MS.,
FLOOD CONTROL STUDY

EXISTING LAND USE

U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

PLATE J–5



NOTE: LEVEE ALIGNMENT INDICATES LINE OF PROTECTION. LEVEES WILL GENERALLY REQUIRE 3-FEET OF FREEBOARD. HOWEVER, IF NATURAL GROUND ELEVATION EXCEEDS THE DESIGN WATER SURFACE PROFILE BY 1-FOOT OR MORE NO LEVEE WILL BE REQUIRED.

Legend

- PUMPING STATION & FLOODGATE
- MINOR DRAINAGE STRUCTURE
- LEVEE ALIGNMENTS
- SUMP AREA

PEARL RIVER BASIN, MISSISSIPPI AND LOUISIANA
SLIDELL LA. / PEARLINGTON MS.
FLOOD CONTROL STUDY

RECOMMENDED PLAN

U.S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

Date: AUG. 1985 File No. P-14-2

PLATE J-22